623.45114
K63m

Manual of GRENADES *and* BOMBING

MAJOR WILLIAM KIRBY
U. S. ARMY

LIBRARY OF THE
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

623.45114
K63m

The person charging this material is responsible for its return to the library from which it was withdrawn on or before the **Latest Date** stamped below.

Theft, mutilation, and underlining of books are reasons for disciplinary action and may result in dismissal from the University.

UNIVERSITY OF ILLINOIS LIBRARY AT URBANA-CHAMPAIGN

MAY 1 1 1977
APR 2 1 1977
MAR 2 7 1978
MAR - 9 1978
MAY 2 0 1978
DEC 7 1978
DEC 9 1978
OCT 1 0 1980
OCT 3 1 1980
NOV 1 2 1980
OCT 1 5 1980
DEC 1 9 1980
DEC 2 1980
JUN 2 3 1982
1984

Manual of
Grenades and Bombing

MAJOR WILLIAM KIRBY, U. S. ARMY

Published by
EDWIN N. APPLETON
1 BROADWAY
NEW YORK CITY

Copyright Applied For

623.45114
K63m

TABLE OF CONTENTS.

INTRODUCTION 5

CHAPTER I: Selection, Framing and Organization of Grenadiers.

Part 1.—General 9
Part 2.—Selection of Grenadiers 10
Part 3.—Equipment of Bombers 11
Part 4.—Training of Grenadiers: Physical, Individual, Squad Instruction, Organization 13
Part 5.—Training Fields 41
Part 6.—Notes on Grenade Training 44

CHAPTER II: Tactical Employment of Hand Grenades in Offense.

Part 1.—Tactical Employment of Hand Grenades in Offense 51
Part 2.—Defence of a Trench by Grenades 58
Part 3.—Warning 62

CHAPTER III: Tactical Employment of Hand Grenades in the Offensive.

Part 1.—General 67
Part 2.—Capture of a Blockhouse or a Machine-Gun Position 81
Part 3.—Employment of Bombers in an Attack on a Large Scale Across the Open 84

CHAPTER IV: Supply of Grenades.

Part 1.—Method of Supply 87
Part 2.—Supply of Grenades in Attack 90
Part 3.—Allowances of Grenades 94

CHAPTER V: Throwing Grenades.

Part 1.—Mechanical Method of Throwing Grenades 95
Part 2.—Projecting Apparatus for Grenades 99
Part 3.—Grenade Mortars 103

CHAPTER VI: Protection.
Part 1.—Protection Against Grenades..... 19
Part 2.—Precautions in Handling Live Grenades..... 10
Part 3.—Care and Storage of Grenades..... 10
Part 4.—Method of Carrying..... 11

CHAPTER VII: The French Grenadier and His Arm.
Part 1.—Elementary Training of Infantrymen..... 11
Part 2.—Instruction of the Grenadier Squad..... 11
Part 3.—The French Grenade Manual..... 12

CHAPTER VIII: Description of British Grenades and Instruction for Their Use.
Part 1.—General Remarks 13
Part 2.—Description of Various Grenades..... 13
Part 3.—British Bombing Operations, With Examples.. 15

CHAPTER IX: Description of German Grenades and Instruction for Their Use.
Part 1.—General Remarks 16
Part 2.—Description of German Grenades..... 16
Part 3.—German Grenade Tactics..... 18

CHAPTER X: Suggestions for Syllabus of Training.
Part 1.—Elementary Training 197
Part 2.—Suggested Tactical Problems for Grenadiers.. 203
Part 3.—Assault Prepared by Grenadiers—Executed By a Small Group of Skirmishers..... 204
Part 4.—Combat on the Enemy Position..... 205
Part 5.—Organization of Captured Ground..... 212
Part 6.—Method of Using the Rifle and Bayonet When Attacking Around a Traverse..... 213
Part 7.—Résumé of Training..... 215
Part 8.—Résumé of Instruction..... 231
Part 9.—Course in Revision Bombing School..... 238

CHAPTER XI: Lecture by Capt. H. Amann on Grenades.. 241

INTRODUCTION

THE exact time of the advent of hand grenades as an instrument of war is uncertain, but is known to date back to the Battle of Arles in 1536. The hand grenade, which is playing such an important rôle in the war, is essentially the same weapon that the soldiers of the sixteenth and seventeenth centuries used with deadly effect. In those days the grenade was a spherical shell of iron filled with gunpowder and exploded by means of a time fuse. Practically the only change effected by four hundred years of military experience has been the substitution of trinitrotoluol—a high-power explosive, usually referred to as "t. n. t."—for gunpowder. The spherical shell remains the same and even the time fuse is unchanged, except that in the very latest types the fuse is lighted by means of a trigger attachment.

Despite the fact that the term grenadiers persisted until after the Napoleonic campaign, the hand grenade as a weapon of warfare fell into disuse at the end of the Seventeenth Century. Numerous inaccuracies in their manufacture and the uncertainty of their explosion—an uncertainty which gave rise to the expression, in use to the present day, "hoist by his own petard"—caused their abandonment. It was not until the Russo-Japanese War that the hand grenade came back, but the great havoc wrought by the "spheres of death" on the slopes which led up to the fortifications at Port Arthur, proved that the grenade had come back to stay.

Now there is not a large army in the field today that is not equipped with millions of these missiles, nor a military power that is not training its men in the art of fighting with these weapons. The German Army uses several types of the hand grenade, apparently experimenting with all of them in an effort to discover which is the best suited to modern warfare.

Of these the "Shaba" is the smallest, and comparatively speaking, the least dangerous. It is practically a replica of the grenade used at the Battle of Arles. The use of gunpowder assures a loud report which is thought to be utilized principally for its psychological effect and because it is far less expensive to manu-

facture than the "t. n. t." grenades. Anyone can make one o these bombs in a few moments , being merely a jam tin or toma toe can, some gunpowder and a fuse. A few bullets mixed wit the gunpowder add a deadly element to the otherwise mild ex plosion.

The German "head" grenade is a spherical bomb, equipped wit a trigger which sets a five-second fuse and is packed full of "t n. t." while the "cylinder" grenade is larger and of a differen shape. Still another variation is the "disc" grenade, resembling very thick dinner plate which can be sailed through the air o hurled like a discus. Because of the difficulty of delivering thi weapon from the shelter of a trench, its use is confined to th comparatively infrequent attacks in the open.

The British and French armies are making an extended use o the "bracelet" grenade—a spherical bomb with a heavy trigge attachment which fits over a thong or cord or leather attached t the wrist of the grenadier. The bomb-thrower hurls his grenad and the jerk, as the weapon tears itself away from the bracele sets the trigger, igniting a five-second fuse. This method, a though found to be clumsy, is of considerable value because o the fact that if the grenadier is killed or wounded before th bomb leaves his hand it does not explode in his own trench, as often the case when a time fuse alone is used.

The rifle grenade—a British adaptation of the hand grenade—i used when the range is too long to be covered by human strengt This weapon is formed of a brass tube, an inch and a half i diameter, enclosing a smaller tube. The space between the tube contains four ounces of trinitrotoluol, exploding upon contact b a cap containing fulminate of mercury, which is attached to th front of the small tube and protected against accidental explosion The front end of the outer tube carries two heavy steel rings deeply indented, so that the explosion hurls the metal in all direc tions. At the rear of the grenade is a steel rod which is inserte into the barrel of the rifle, and the entire missile is hurled by th use of blank cartridges filled with carefully graded charges s that any range from fifty to three hundred meters may easily b covered. The steel rod of the grenade acts like the stick of rocket and causes the bomb to land head first.

These grenades may also be thrown by hand, although the

are more difficult to handle than are the spherical or cylindrical missiles.

The operations of a band of modern grenadiers resemble those of a submarine crew in that a periscope is used to direct the fire from the trench. The periscope is handled by an experienced observer—correspondence to the range-finder on a battleship—who calls off the precise distance at which the grenades are to land.

"Forty meters!" he cries. And a test grenade rises from the interior of the trench, while the observer watches it closely through the periscope.

"Two meters to the left!" Another test shot is made and the grenade explodes in precisely the right spot. From this time on it is merely a question of how much training the grenadiers have had to obtain results.

The degree of accuracy to which the human arm may be trained for grenade fire is truly remarkable. Reports to the War Department from American military observers abroad, indicate that an expert grenadier can throw his bombs for more than an hour at varying distances, without missing the precise range more than once in ten times.

One thing the American soldier must learn is that the "overhead" or "baseball" throw cannot be used with the type of grenade now in vogue. At the present time it is essential that the missile be thrown with a perfectly stiff arm. The official British Regulations on the subject read as follows: "Turn to the right, with the left shoulder away from the objective. Extend the right arm away from objective and throw by swinging the arm over the head." This is of course for a right handed man and would be reversed for left-handed men. The high angle of fire, so that the grenade may drop as nearly as possible in a straight line on the enemy's trench, is one of the essential features of modern grenade work, and while the average American's arm is accustomed to handling a baseball, he soon finds that unused muscles are called into action by this work that he never had much use for before. Another objection to the baseball method of delivering a bomb is that it necessarily exposes the upper portion of the thrower's body.

The great principle of grenade warfare is, "You must injure the enemy but at the same time conserve your resources."

CHAPTER I.

SELECTION, TRAINING, AND ORGANIZATION OF GRENADIERS

PART 1.

1—General:

All officers and men of organizations trained to fight on foot should be instructed in the construction and use of hand and rifle grenades. This instruction must be progressive for individuals as well as for organizations.

In the beginning a small number of specially selected officers, noncommissioned officers, and privates of each regiment should be sent to the grenade school to take a 15-day course of instruction, in order to fit them to act as instructors for their several organizations. Upon successfully completing the course at the grenade school and receiving their certificates to this effect, this detachment should immediately be returned to their regiments to begin the selection, organization, and training of grenadiers, as prescribed hereafter.

At Aldershot the course is 10 days for classes composed of 40 officers and 40 noncommissioned officers, who, after graduation, are returned to their battalions as instructors. A proposed syllabus for a course of training is given in Chapter X.

The Canadian Grenade School, at Shorncliffe, England, trains 60 officers, 60 noncommissioned officers, and 300 privates per month in the handling, throwing, and care of grenades; the care and use of explosives; the making of bombs; the use of trench mortars, spring guns, catapults, and other appliances; and in the latest methods of trench fighting. The course of study lasts one month for officers and noncommissioned officers; the first two weeks as pupils and the last two as instructors of the privates in the school. The course for privates is two weeks.

Germany is said to have introduced the grenade into the present war, and both in her recruit depots and her rest billets

behind the lines the men are constantly trained and exercised in bombing. The German ideal is to have every infantry soldier a trained grenadier.

PART 2.

2—Selection of Grenadiers:

All efforts should at first be directed to providing one thoroughly trained grenadier squad in each company. Under the supervision of all officers of the company, the men should be assembled and tested in throwing by any straight-arm method the individual chooses to adopt. If no dummy bombs or grenades are available, small sand bags or pebbles weighing about 1.5 pounds may be used as a substitute. The men should be required to throw at a mark, and those who attain the greatest accuracy and distance should be told off for further tests. This party should then be tested in the prescribed methods of throwing hand grenades, and those showing the greatest aptitude should be selected to the number required from each company for training. This number should be about double that needed for service in order to provide for the inevitable eliminations during training and for substitutes to replace casualties in the early periods of service.

The smallest number of men required to carry out an operation with grenades is 6—2 riflemen, 2 carriers, and 2 throwers. The instruction squad should therefore consist of 12 men. There should be 1 noncommissioned officer and 1 spare man for each 6 men, making a complete grenadier squad of 2 noncommissioned officers and 14 men. Each and every man requires individual instruction and supervision, and larger squads would make this difficult, if not impossible.

The number of squads per company must be increased from 1 to about 4, as opportunity offers. The latest reports (1917) indicate that of the 194 men in a French infantry company, 4 noncommissioned officers and 28 men use hand grenades, while 24 men use rifle grenades. Each company of Canadian infantry has 32 men in its grenadier detachment.

The men finally chosen as indicated above, should be those

showing the greatest natural aptitude for the service and duties required, which aptitude it is intended to develop by training. They should, in addition, be intelligent, physically fit for the hard manual labor involved, full of initiative and resources, and cool in emergencies. This latter characteristic can only be discovered when a crisis occurs, and any man failing to meet this crucial test should at once be returned to duty with his company. It will often be found that the most unlikely looking men are those who rise to the occasion in emergencies.

It must be remembered that grenade fighting in the trenches often develops into a duel between single squads or even single grenadiers, and the side which shows the most resource and cunning, and whose grenadiers can throw to the greatest distance and with the most accuracy has the best chance of winning.

PART 3.

3—Equipment of Bombers:

Bombers should be as lightly equipped as possible. In the case of grenade operations and raids, the men who are actually to throw grenades should not carry rifles, but may be armed with revolvers if they have been taught to use them, or with a bayonet or special stabbing knife or weapon for hand-to-hand fighting, such as an ax. In a general attack all men will usually carry rifle and bayonet. Bombers must therefore be taught to throw with rifle slung over left shoulder. Steel helmets should be worn by all men taking part in grenade attacks.

Grenades are best carried in a canvas bucket or haversack to hook to belt.

4—Grenade Carriers:

The following patterns of grenade carriers have been found generally useful:

(a) *Bucket carrier* (Fig. 1).—This is a canvas bucket with double bottom. It is carried by a sling of adjustable length, and will hold 20 Mills grenades. It is closed by a cord.

A very efficient bucket carrier can be made from an ordinary sandbag, doubled over at the top, with a side and bottom stiffening of wire petting and a rope handle.

Care should be taken that the safety-pins are not bent when grenades are carried in a bucket.

(b) *Belt bag carrier*—A canvas bag with steel hook, to be carried on waist belt and hold four Mills grenades. The bag is closed by a piece of string. Various other types are in use.

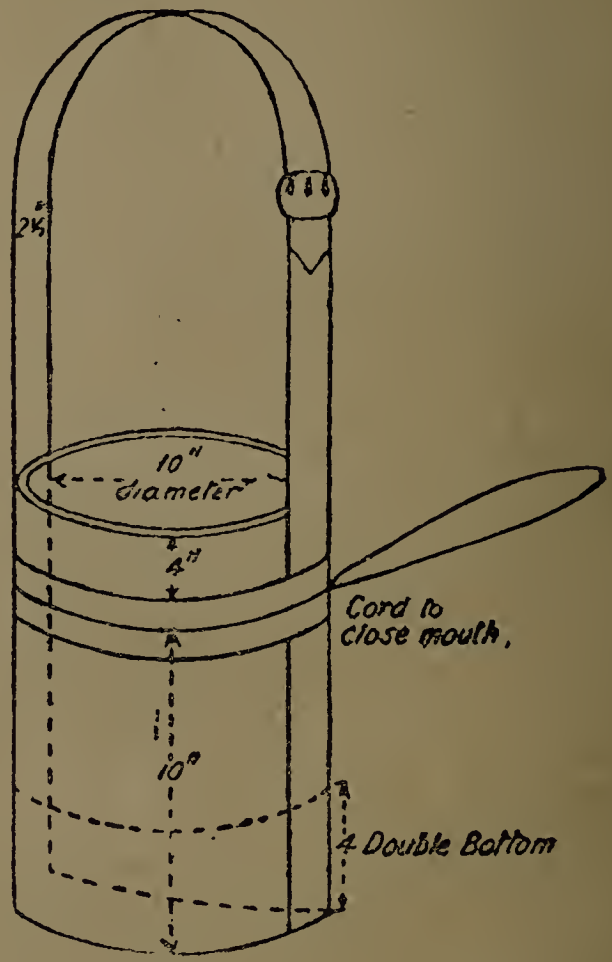


Fig. 1

(c) Waistcoat pattern, with pockets, to carry 10 Mills grenades.

5—Equipment:

The following number of grenades will be carried by the personnel of bombing squads:

	Mills Grenades	Rifle Grenades	Smoke Bombs
N. C. O.	6	4	2
2 Bayonet men	12	....	4
2 Throwers	24	....	4
2 Carriers (Reserve Throwers)	24	....	4
2 Rifle Bombers	8	20	..
	74	24	14

(NOTE.—Smoke bombs contain considerable phosphorus and are exploded in dug-outs for the purpose of smoking out the occupants.)

In addition to the above, each infantry soldier will receive 2 Mills grenades. The requisite number of grenades will be issued to battalions previous to operations and will become part of their equipment. The grenades should be carried in the lower pockets of the jacket and be carefully inspected by the platoon officer concerned.

That is a fair guide to the individual equipment. There was in addition a large reserve of grenades provided for, but the men's loads were limited as shown.

No grenadier organization or equipment has been prescribed as yet for the American service, but the conditions on the Western Front that the armies are facing today, are such as to call for that organization before they can successfully cope with the enemy there. Hence, we can expect a reorganization ere long, and as we will probably profit by the experience of the Allies, the new organization may be expected to approximate those herein set down.

PART 4.

TRAINING OF GRENADIERS.

6—A Physical Instruction of Grenadiers:

To develop the physical condition of the men, the day's work should begin with calisthenic exercises and short talks on per-

sonal hygiene. This should be followed by exercises in throwing, climbing out of and running along trenches, bayonet fighting, and other movements relating to grenade fighting.

A. Introductory Exercises.

7.—Physical Exercises for Bombers:

1. Leg exercise: *Head forward. Heels raising and knees bending (four times).
2. Neck exercise: Head turning quickly (3 times in each direction).
3. Arm exercise: *(*a*) Arms swinging sideways and upward (six times). *(b) Arms sidewise stretch. Arms swinging forward (four times). Hands to be turned palms facing during the movements (*a*) and (*b*).
4. Trunk exercise: *Feet astride. Arms side stretch. Trunk bending sideways quickly (three times in each direction).
5. Lunging exercise: *Head forward, feet full outward. Lunging outward (three times each foot).

B. General Exercises.

1. Prep. for feet astride. Arms upward stretch: Trunk bending backward (three times). Spring back. Comp. exercise feet astride. Head forward: Trunk bending forward and full downward (twice).
2. Balancing exercise: Head forward. Leg raising forward, sideways and backward (3 times each leg).
3. Lat. exercise: *(*a*) Head forward, feet outward place, trunk to the left (right) turn. Trunk bending sideways (three times each side). (Note.—Trunk always to be turned and bent toward the rear foot. *(*b*) Arms bending, feet sideways place: Trunk turning quickly, with arms stretching upward (three times in each direction).

This should not be done in the ordinary double time; but, in order that the men may learn to make full use of their legs in getting over the ground, every attention should be paid to developing a long springy stride on the toes.

Dummy bombs or small sandbags of approximate weight should be carried to accustom men, when moving rapidly, to pass bombs to each other without dropping them.

Starred (*) exercises indicate that these are specially adapted for developing the muscles used in bomb throwing.

4. Abdomen exercise: (*a*) On the hands—Arms bending (up to three times). Add later "with leg raising."

5. Dorsal exercise: Arms bending, F. sidewise placed, trunk forward bending—Arms stretching sidewise. Later, arms stretching upward.

Or Feet astride. Arms upward stretching, trunk forward bending. Arms swinging downward and backward.

6. Marching exercise: Quick march. Double march. Marching on the toes. To be done each time.

Quick sprints.

Relay race, or a short sharp game to develop speed and wind. (Only for a few minutes, but with energy and dash).

7. Jumping and vaulting exercise:

(*a*) Upward jumping, with arms swinging sideways and upward.

(*b*) Upward jumping, with arms swinging upward.

(*c*) Running forward and jumping high and long jumps off a mark, with rifles and fixed bayonets.

(*d*) Vaulting over beams, walls, etc., as available.

(*e*) Jumping into and getting out of shallow and deep trenches.

N. B.—Only one or two of the above exercises daily, according to time available, until the men are proficient. When proficient they can be run over an obstacle course, which should include obstacles that will cause them to put into practice all they have been taught hitherto, but in a more practical form.

C. FINAL EXERCISES.

1. Leg exercise (four times).

2. Trunk exercise, head forward: Trunk turning (twice in each direction).

3. Correction exercise: Arms raising forward and upward, lowering sidewise and downward (until the action of the heart and lungs is eased).

NOTE.—Quickening exercises, for the purpose of relieving monotony and instilling dash, should be introduced here and there during the table.

8.—Throwing Practice:

In order to utilize the throwing muscles, developed individual-

ly by exercises, they must be capable of coordinated action. This is best developed by actual throwing practice.

A convenient and practical method of developing this coordination of the throwing muscles is by means of "medicine" bag practice.

A "medicine" bag can be made of strong canvas filled loosely with sand (damped before using), dried peas, beans, etc., in weight about 2 pounds.

This practice is carried out by two men, standing from 8 to 12 paces apart, throwing the bag from one to the other. The bag must be thrown or bowled with the correct bomb-throwing action, slowly and deliberately, so that each muscle is brought into use. The thrower must endeavor to make a "good shot" with the bag and throw it into the opposite man's hands, which should be held close up against the chest, open and ready to catch the bag. The bag is caught and thrown or bowled back in the same manner.

The practice should cease as soon as the throwers feel the strain and commence to lose the correct throwing positions; the practice throughout must never be hurried.

This training can be carried out by big classes, and in a room as well as in the open. Not only are the throwing muscles trained and the length of throw increased, but good direction and alertness are developed.

THE TRAINING AND EMPLOYMENT OF BOMBERS

9—General Principles:

1. The nature of operations in the present campaign has developed the employment of rifle and hand grenades both in attack and defense to such an extent that the grenade has become one of the principal weapons in trench warfare.

The grenade is essentially a weapon for trench warfare or for very close fighting, and should rarely be used in the open, where rifle fire is much more effective.

Every Infantry soldier and machine gunner must receive instruction in grenade throwing, and must at least know how to use the Mills grenade, and have thrown a live one in practice. It is not every man, however, who possesses the temperament or the qualifications necessary to make a really efficient bomber.

There should be, therefore, in every platoon at least one noncommissioned officer and eight men with a higher degree of efficiency and training than the remainder. These men are available either to work with the platoon or to provide a reserve of bombers for any special object. Some battalions have in addition a platoon of battalion bombers, trained and administered as a separate unit of the battalion organization.

Bombers should be carefully selected; men fond of outdoor games are the easiest to train.

The foregoing is applicable also to Cavalry, who should have squads of expert bombers trained for use in the trenches. At least one noncommissioned officer and four men per troop should be expert bombers.

2. The responsibility for giving all men an elementary but practical knowledge of the use of hand and rifle grenades rests with battalion and company commanders. If possible, one officer per company should be specially trained in bombing work, and there should be one noncommissioned officer per company selected to assist in training and also to supervise the supply and storage of the grenades in charge of the company.

In each battalion there should be a specially selected subaltern officer who will command the battalion bombing platoon, if there is one, assist company commanders as required, and supervise the supply and storage of grenades.

As a general principle, the responsibility for giving to a proportion of men the advanced training necessary for expert bombers should rest with battalion and company commanders. In practice, it is not always possible for battalions under active service conditions to find the time or obtain the necessary facilities. It is, therefore, usually adviseable to form brigade or divisional schools to train instructors for battalions; and to hold courses for the training of expert bombers for battalions when no facilities exist for their training in the battalions themselves.

10—Training of Grenadiers:

The training of grenadiers must not be too much restricted by hard and fast rules. Instructors must be constantly on the alert for new methods of training and operation, and nothing contained herein is to be construed as limiting in any way the

initiative and originality of any officer or man, so long as safety is secured and satisfactory results are obtained.

The general principle to be followed in training grenadiers is to first give the individual a thorough knowledge of his duties and then to teach him by progressive methods to act in combination with his comrades; that is, the course of instruction is divided into two parts: *1. Individual instruction; and, 2. Squad instruction.*

11—Individual Instruction:

The men selected from each company are grouped into squads of 14 men and 2 noncommissioned officers. The senior noncommissioned officer is in charge of the squad and is responsible for its training, under the supervision of the regimental bombing officer, who is assisted by one of the company officers.

All training is carried out under the strictest discipline. A careless grenadier is a source of danger to himself and to his comrades. Slackness leads to indifferent work in the field, and nothing but discipline and courage can bring to success the work of grenadiers in actual fighting. Any display of carelessness should result in the immediate relief of the individual from the grenadier squad.

All practice must be conducted under service conditions with the men, except the throwers, fully armed and equipped, less the pack. The throwers do not ordinarily carry the rifle, but are armed with a pistol and a knife for their personal protection. In the case of carriers or other men who carry special apparatus, such as the periscope or a throwing devise, the rifles should be slung vertically over and behind the left shoulder.

The instruction is both theoretical and practical, and these two branches should be carried on simultaneously, the one serving as a relief to the fatigue induced by the other. The following is taught by lectures, illustrated at first by photographs and later by actually taking apart the service grenades, and by taking the positions and going through the motions indicated as most suitable for throwing:

(*a*) The precautions to be observed in handling explosives in general, and of grenades in particular.

(*b*) The general principles of detonating explosives.*

* See Weaver's Explosives, and Primer of Explosives issued by the Bureau of Mines.

(*c*) The method of making and using an improvised bomb (tin can, bottle, iron pipe).

(*d*) The classification, mechanism, and use of all the different service models of bombs, hand grenades, and rifle grenades in our own and foreign armies.

(*e*) The mechanics of the throw which gives the greatest accuracy and distance, with the least fatigue.

(*f*) The construction and uses of the periscope in grenade warfare.

In these lectures special emphasis should be laid on the fact that, in the hands of an intelligent and careful man, a grenade is a perfectly safe and efficient weapon; but, in the hands of an ignorant or careless man, it is a danger to himself and to his comrades. Any man doing careless or foolish things with explosives should be returned to his company at once.

The physical condition of the men should be developed to the highest possible degree by suitable exercises related to the work of grenadiers. Among these exercises throwing grenades for distance and accuracy, barricading, and bayonet fighting at close quarters should have a prominent place. At the same time the men should practice correction of the throwing by the use of the periscope, and should be drilled in the movements required in storming and clearing trenches.

12—Scope of Individual Instruction:

(A) The Precaution to Be Observed in Handling Explosives in General and of Grenades in Particular.

This should be taught by means of simple lectures on the composition, characteristics, uses, packing, shipment, handling, storage, and preservation of all the usual military and commercial explosives, and of grenades, samples of all of which should be shown, with special reference to their advantages for use in improvised and service grenades, and the precautions to be observed in such work. Emphasize the fact that the danger in handling and using explosives and grenades is a direct function of the ignorance or carelessness of the men doing the work.*

* See Chapter XXV, Coast Artillery Drill Regulations, 1914; Engineer Field Manual; and Ordnance Pamphlet No. 1741, 1917.

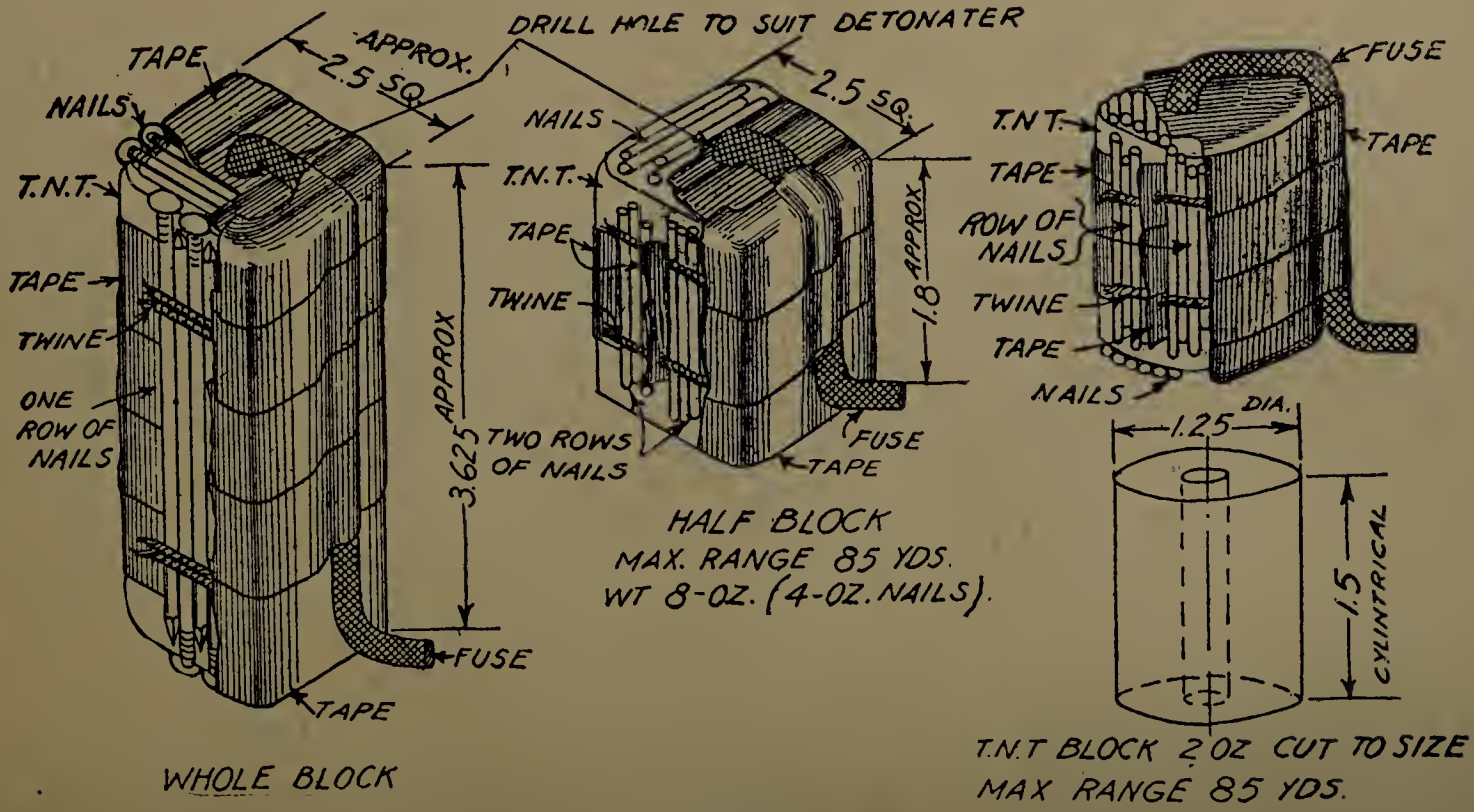

TAPE
NAILS
T.N.T.
TAPE
TWINE
ONE ROW OF NAILS
APPROX. 2.5 SQ.
3.625 APPROX
FUSE
TAPE
WHOLE BLOCK
DRILL HOLE TO SUIT DETONATER
NAILS
T.N.T.
TAPE
TWINE
TWO ROWS OF NAILS
2.5 SQ.
1.8 APPROX
FUSE
TAPE
HALF BLOCK
MAX. RANGE 85 YDS.
WT 8-OZ. (4-OZ. NAILS).
FUSE
T.N.T.
TAPE
ROW OF NAILS
TWINE
TAPE
NAILS
TAPE
1.25 DIA.
1.5 CYLINTRICAL
T.N.T BLOCK 2 OZ CUT TO SIZE
MAX RANGE 85 YDS.

Fig. 2

Instructors are cautioned that the greatest care must be taken in handling explosives, and especially when used in live grenades, and they must use every effort to insure that familiarity with explosives does not lead to carelessness in handling them. Adequate supervision must be insisted upon at all times, and commanding officers will be held responsible that officers competent to act as instructors are present, and that every possible precaution is taken whenever live grenades are being handled.

PRECAUTIONS.

The following precautions are among those which must always be observed:

1. Do not permit the use of live grenades until men are thoroughly trained in handling dummy grenades. Untrained men are very erratic and may injure themselves and the bystanders.

2. If the grenade is "tossed," swinging in a vertical plane, great care must be taken to see that it does not hit the ground or other object during the swing.

3. Do not permit the throwing of a live grenade unless cover is at hand behind which the thrower and spectators may seek shelter before the grenade strikes the ground. It is unsafe to remain in the open when a grenade explodes.

4. In handling live grenades always hold the body of the grenade in the hand, and never lift it by means of the rope or streamer, which sometimes breaks, particularly after the grenade has been thrown.

5. Do not arm the grenade until the moment for firing.

(B) THE GENERAL PRINCIPLES OF DETONATING EXPLOSIVES.

Simple lectures on the various types of military and commercial detonators and firing devices, fuses of all kinds, primers, percussion caps, etc. The instruction should include the method of ignition employed for each class of detonators and their application to the different kinds of explosives described above, together with the precautions to be observed in handling and using each kind of firing device to prevent accidents, as well as failures to fire, especially when used in grenades. Methods of arming and detonating or firing each kind of service and improvised grenades.

(C) THE METHOD OF MAKING AND USING IMPROVISED GRENADES.

Explanation and illustration of making grenades on the field of battle, including containers used (tin cans, bottles, iron pipe, blocks of explosive bound up with nails, etc.; the explosives most likely to be found available (commercial dynamite, blasting powder, gun cotton, trinitrotoluol); and the fuses which will probably be at hand for firing the same (slow match, percussion caps, fire crackers, toy torpedoes). Include in this the making of smal improvised mines for blowing in trench walls and brief instructions for demolitions. (See Engineer Field Manual.)

(D) THE CLASSIFICATION, MECHANISM, AND USE OF ALL THE DIFFERENT SERVICE MODELS OF BOMBS, HAND AND RIFLE GRENADES IN OUR OWN AND FOREIGN ARMIES.

This should include a detailed explanation and demonstration of the working of all available models of service grenades, first by showing the photographs and then by taking apart and reassembling the grenade by the instructor and afterwards by each man of the squad.

According to range, grenades may be divided into three classes:

1. Hand grenades, with a maximum range of about 50 yards. Among these we find explosive grenades, poison gas grenades, tear-producing grenades, suffocating grenades, incendiary and smoke-producing grenades.

2. Rifle grenades, with a range of 50 to 320 yards, and of the classes indicated above.

3. Trench-gun grenades, with ranges from 200 to 800 yards, depending upon the gun, and of the same classes as indicated above.

Hand grenades are in general made up of a body or explosive box containing a certain quantity of explosive and an ignition or detonating device.

On the basis of their tactical employment hand grenades may be divided into two classes—

(1) The *defensive* grenade generally has a cast-iron body, which, when the grenades explodes, breaks up into fragments of sufficient size and weight to seriously or mortally wound a man

within a radius of at least 30 yards. With this grenade an impassable barrage can be produced by grenadiers 15 yards apart, but this grenade can only be used when the grenadier is protected by trenches or other cover from the fragments of his own grenades.

(2) The *offensive* grenade generally has a body made of sheet metal or other material, which, when the grenade explodes, does not produce fragments which will cause injuries at close range. These grenades are effective, due to the force of the explosion or blast, within a radius of about 7 yards. An impassable barrage is established if the grenadiers are about 10 yards apart. This grenade can be thrown far enough so that there is no danger to the grenadier throwing it even when without cover.

The British now use only the defensive type of grenade, while the French have both the offensive and defensive types.

On the basis of method of ignition hand grenades may be divided into two types—

(1) The *percussion* grenade is arranged to explode immediately on striking the ground. This type has the disadvantage in trench warfare of being more dangerous to the thrower and his comrades, since the accidental strike or graze on the trench or the clothing or equipment of the thrower may produce an explosion; and besides this, unless the grenade strikes directly in the hostile trench, it may explode without doing any damage; that is, the men in the trench will be protected.

(2) The *time-fuse* grenade is arranged so that the time train is ignited by the striking of a match or the firing of a primer before the grenade is thrown, or at the instant of its departure from the hand. The advantage of this type of grenade lies in the fact that it is safer to use, and also especially because, even if striking in front of the trench or shelter, it may roll into it before exploding and thus injure the personnel that are under cover.

In order to avoid confusion in joint attacks an agreement has recently been entered into by the French and British Armies that none but time-fuse grenades will be used in either service. Percussion grenades are largely used in the Italian service.

The instruction under this heading should enable each man to

use any grenade without danger to himself or to his comrades and should give him the confidence that he can do so.

Special attention should be given to the following points:

1. Every grenade is very dangerous if handled without precaution.

2. The detonator or firing device is dangerous by itself.

3. If the fuse takes fire accidentally, it should be thrown as far away as possible. As soon as a fuse is fixed to a grenade, all rough handling must be avoided.

4. Precaution with live grenades which fail to explode. After each exercise in throwing live grenades, those which fail to explode must be disposed of in such a way as to avoid danger to all concerned.

In the case of grenades with time fuses, at least 10 minutes must be allowed to elapse before any person is permitted on the range to hunt for unexploded grenades. At the end of this period, time-fuse grenades may be considered harmless and will be carefully collected into a small pit in the ground. A small charge of explosive, primed with about 10 feet of time fuse, will be placed in the center of the pile of grenades in the pit. A tamping of dirt will be placed over the pile of grenades, and the charge fired, care being taken to see that a complete detonation of all grenades results. When ready to explode the charge, all the personnel should be under cover, and a noncommissioned officer should light the fuse.

In the case of grenades with percussion fuses, no attempt will be made to move the unexploded grenades, which must be destroyed where they lie. A small charge of explosive should be placed in immediate contact with each grenade to be destroyed, without disturbing the position of the grenade. The charge is fired with a time fuse, after covering the charge and the grenade with a few shovelfuls of earth, without tamping. In case of a misfire of the explosive charge, a wait of 10 minutes is required before making a second attempt to destroy the grenade. It is expressly forbidden to try to remove the primer from an unexploded grenade by unscrewing the cap.

No grenade which has failed will again be thrown or fired.

(See Ordnance Department Pamphlet No. 1741.)

The description and methods of handling United States grenades will be found in the pamphlets on the different types issued by the Ordnance Department, and these instructions should be carefully studied and accurately followed by all concerned.

13—The Mechanics of the Throw which Gives the Greatest Accuracy and Distance:

Grenade throwing is the most important branch of grenadier training, and a very high standard of accuracy is required, for, besides the advantage it gives in combat, it diminishes the risks of accidents and the consumption of grenades. The moral effect of a grenade bursting exactly in a hostile trench is added to its destructive effect. Follow accurately the prescribed methods of priming and throwing; work rapidly but without hurry, calmly and coolly.

Careful practice on sound lines is essential to success, and a considerable portion of the time available for training must be devoted to it. The difficulties in throwing are greatly augmented when, as is usually the case, throwing is to be done under complete cover, and according to directions given by an observer. The men throwing must be made to understand clearly at the beginning of their training that nothing can excuse inaccurate throwing, and instructors must not be satisfied until each man can throw from behind cover and in obedience to the directions of an observer, missiles of varying weight and size into a specified trench from any reasonable distance and in any direction.

In all practice involving the use of cover the men must work in pairs, one observing and the other throwing. The training of the observer is of the greatest importance, as he must be able to give distance and direction quickly and accurately. He must give his corrections in positive terms, in the form of short, sharp, clear words of command, and the thrower must be ready and able to understand and obey. The observer must learn to use the periscope, and should operate it throughout the training.

Simple lectures should be given on throwing under different conditions, beginning on open ground and then in trenches, standing, kneeling, and lying down. Special emphasis should be given to the necessity of taking cover from our own grenades, showing by diagram the radius of action and direction of flight of fragments and balls. Illustrate this talk by moving pictures, photo-

graphs, and then by taking up the prescribed positions for throwing; but permit any *safe* method of throwing which promises good results in individual cases.

Methods of throwing vary not only with different individuals but also with different types of grenades. Experience has shown that accuracy is harder to obtain at short ranges than at the maximum range obtainable without undue exertion. It has been found that the accuracy of the throw is surprisingly effected by the presence of an actual wall in place of a hypothetical wall such as may be made by a string or a piece of board. Therefore a large part of the training should be in throwing at ranges of from 15 to 20 yards, and over actual parapets.

Include the method of holding the hand grenade, of arming or setting it for firing, and the precautions to be observed for safety to our own forces, and to secure the greatest damage to the enemy. *The grenade must never be thrown horizontally. Its fire must be plunging. In case ignition is not apparent, consider the grenade ignited, and throw at once, without delay.*

Precision in throwing gives a great advantage, besides reducing the risk of accidents and the consumption of grenades. The normal method of throwing the French hand grenade in the open is shown in the following figures:

Initial position (fig. 3).—Aim at the objective with the extended left arm, with the grenade in the right hand and the right arm falling naturally by the side. The shoulders, the extended left arm, and the objective should be in the same vertical plane.

First motion (fig. 4).—With the left arm pointed in the direction of the objective, carry the right hand up to the left, for the purpose of arming or igniting the grenade, if necessary, and for starting the swing.

Second motion (fig. 5).—With the left arm pointed in the direction of the objective, swing the right arm downward and backward, as far as possible, in a vertical plane, keeping the eyes on the grenade to avoid hitting the ground or wall, at the same time extending the left leg and bending the right knee.

Third motion (fig. 6).—Cast the eyes at the objective, or at the aiming point, if throwing from a trench.

Fourth motion (fig. 7).—With the right arm describe the arc

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

of a circle in a vertical plane, the right shoulder and the body following the movement of the arm, extending the right leg and bending the left knee. The left arm is swept vigorously downward and backward, following the left shoulder, which is sharply "refused."

The finish (fig. 9).—Finish with the entire weight of the body in the throw. The grenade thrown under these conditions should fly in the direction in which the left arm was pointed, and the maximum range should be obtained. The right arm acts like a catapult. The time of the throw is about two seconds.

14—The Construction and Use of the Periscope in Grenade Warfare:

Describe and illustrate by diagrams, photographs, and actual service periscopes the principles of construction and the use of the trench periscope in correcting the throwing of grenades in order to place them accurately on the target. Show how to improvise simple but effective periscopes and trench mirrors from the material likely to be available on the field of battle, and how to make simple repairs to all periscopes.

Give each man in turn practical instruction in the use of the periscope in correcting first for direction; then for distance; then for both combined, or for accuracy. This should be continued until each man is thoroughly proficient, and the best men should be selected for permanent observers or range correctors. Keep in mind that in emergency any man in the squad must be able to replace any other man.

NOTES ON THROWING.

Fix the eyes intently in the direction in which the grenade is to fall; judge the distance carefully, as upon that depends the trajectory of the grenade in flight.

Throwing practice for distance and accuracy should be made progressive, starting in the open with dummy or improvised dummy grenades. Accuracy is considered of first importance, and the distance lengthened as the training is continued. The live grenade should be used in practice only where cover is available and by skilled and careful men. Men should be instructed to hold the grenade in such a manner that it is not necessary to change the hold after the grenade

is set for firing. This practice should always be given on the instruction field laid out as described hereafter.

Throw only a few yards, say 10 yards, at first, using this distance 10 or 15 times in order to teach the man to let go of the grenade properly. If he throws with full force the first time, he will handle the grenade so convulsively that he will let go of it at the wrong instant, and hence will throw it too high or too low. This is a very bad habit, and one which is hard to eliminate. Let the grenade go when the hand is at the highest point, allowing it to leave the hand without a shock, and to be sure to follow through with the body.

Throwing practice should be given in short periods, and the intervals used to give talks on other subjects of grenade instruction.

Many men hesitate to use grenades, and care must be taken to give them confidence; for this reason begin with dummy grenades, then use grenades with fuses only, and finally use live grenades. At first long-time fuses should be used, say, 7-second fuses, and the men should be required to count while throwing; thus, 2, 3, 4, (throw the grenade), 5, 6, 7, 8 (the grenade explodes). Later on the fuse should be cut to 4 seconds; the standard throw in the open occupies about 2 seconds.

15—Bayonet Fighting:

Special instruction in the use of the bayonet is essential for grenadiers. The usual bayonet instruction given to all soldiers will accustom them to the use and balance of the weapon and teach the necessary movements. This, however, is not sufficient for the training of a grenadier, but must be supplemented by practice in narrow trenches against living opponents. In trench warfare grenadiers will fight in inclosed and narrow spaces, where shock tactics are impossible. Methods in bayonet fighting similar to those of a swordsman are required, with a perfect combination of eyes, hands and feet. Practice must be designed to develop ability and speed at close quarters. Contests should be arranged between men of the grenadier squad, and the most proficient men should

be selected as bayonet men. The men must be reminded that the rifles should always be loaded and that shooting is often possible and may be the best means of acting effectively in certain circumstances.

16—Barrier and Barricade Making:

Men must be skilled in the rapid making and filling of sandbags, and must be able to quickly construct bomb-proof barriers with any available material. Instructors will indicate the best positions and train their men to block up a trench, using available cover and working against time. In building with sandbags, which must always be properly tied, the bags should be laid in alternate layers of headers and stretchers, and the structure made as solid as possible. The following exercises are suggested:

1. Filling sandbags against time with large and then with small tools.

2. Filling a trench with sandbags.

3. Building a partial barrier, leaving a small space for a passage.

17—Exercises in Trenches:

Make use of simple lectures, illustrated by diagrams, photographs, moving pictures, and by actual trenches on the ground, on the methods of obtaining a lodgment in the hostile trenches by means of the grenade; and practice running along and climbing out of fire and communication trenches with full equipment, including bags or baskets of grenades. As a basis for subsequent squad instruction, include explanations of the best points of attack; the means of supply of grenades, methods of carrying, and depots established; necessity of silence during the operation, communicating by signals, etc. Extend this instruction and practice to the methods of clearing the enemy out of trenches by means of grenades, after a lodgment has been effected; the methods of examining shelters; the advance from traverse to traverse; barricading; blowing in trench walls, etc.

18—Instruction of "Expert Grenadiers":

In addition to the instruction given to all men of the grena-

dier squad, expert grenadiers receive a special course and follow a more thorough training. This special course comprises:

1. The making up of explosive charges.
2. The making of dummy grenades.
3. Utilization of foreign grenades and detonators.
4. The use of trench mortars of low power.

The special objects of the course for expert grenadiers is to make expert throwers with confidence in their skill; to provide men capable of organizing a grenade combat and carrying it to a successful outcome; and to provide leaders among the men to serve as examples to be imitated by their comrades.

19—Tests for Appointment as Grenadiers:

At the completion of the individual training period company commanders will apply the following tests to determine the fitness of the men for appointment as grenadiers:

FIRST TEST.

Eliminating; object, verification of accuracy in throwing.

1. *On open ground.*—Throw 10 dummy grenades to each distance.

Position: Standing, 35 yards; kneeling, 25 yards; prone, 15 yards.

Objective: Trench 1 yard wide, 1 yard deep, and 3 yards long.

Requirement: Not less than 50 per cent. of hits.

2. *From a trench.*—Throw 10 grenades, plunging fire.

Position: Any; throwing trench 6 feet deep.

Objective: Trench 1 yard wide, 1 yard deep, and 3 yards long; distance 30 yards; objective not seen by thrower.

Requirement: Not less than 50 per cent. of hits.

3. *Over traverses.*—Throw 12 grenades in a fire trench.

Position: Standing.

Objective: First 6 grenades over 1 traverse; then 6, over 2 traverses; trench 6 feet deep, 3 feet wide; traverses 6 feet high, 9 feet wide, and 25 feet apart.

Requirement: 5 hits out of each series of 6 throws.

SECOND TEST.

1. *Observing.*—The men work in pairs, one throwing and the other observing; 10 dummy hand grenades are thrown, inaccurately at trenches, at distances up to 30 yards. The observer, using a periscope, announces the corrections after each throw.

Requirement: The observer's corrections after each throw must be such that the next grenade, if thrown as directed, would strike in the objective trench.

2. *Knowledge of mechanism of grenades.*—Take apart one grenade of each service model; ask 6 questions on the characteristics of grenades, detonators, fuses, and primers; 6 questions on the care and preservation, supply and handling of grenades; 6 questions on the tactics of grenade fighting.

Requirement: Not less than 50 per cent. of correct answers.

3. *Throwing exercises as in paragraph 2 of the first test, but using live grenades.*—Throw 6 grenades.

Requirement: Not less than 50 per cent. of hits.

To qualify as a grenadier the candidate must make a general average of not less than 65 per cent. on the entire examination. The first test, which is elementary, may be repeated; a second failure results in sending the candidate back to the instruction squad.

The candidate for "expert grenadier" must have qualified and have the rating of grenadier, and must successfully pass an examination consisting of 10 questions on each of the four subjects prescribed in the special course for "expert grenadiers," with an average of not less than 65 per cent. In addition to this he must, in the opinion of the examining board, have the necessary physical and mental qualities to successfully perform the responsible duties of "expert grenadier."

Grenadiers and expert grenadiers should wear a special chevron denoting their rank, and receive extra pay on the basis prescribed for similar qualifications in small-arm practice.

20—Squad Instruction:

All foot troops should receive sufficient instruction to enable them to pass readily and quickly to the status of grenade com-

bat, and the special instructions given to the grenade squad should enable it to carry out any of the special technical operations for which grenade fighting is suitable.

After the men have received a thorough training in the individual instruction prescribed above, the necessary teamwork will be secured by squad training.

21—Organization of the Squad:

The men of the grenadier squad are divided into *riflemen, throwers,* and *carriers,* according to the duties each is to perform; but each man must understand thoroughly the duties of each of the others, so that he may quickly replace any of his comrades in case of emergency. There is probably no other operation in life where so much depends on efficient teamwork.

22—Duties of the Different Members of the Squad:

The squad commander.—The commander of the squad is responsible for its organization, training, discipline, and leading in combat. He assigns the men to duty according to their aptitudes, directs their operations in combat, organizes the relief of throwers and carriers, and supervises the supply of grenades.

If the squad is acting alone, the general rule for the squad commander is to act aggressively, seizing every opportunity to press forward; if this is impossible, he defends the ground held, foot by foot, piling up barricades.

The riflemen.—The riflemen must be chosen from the men who are most aggressive and elert, and must be good shots and handy with the bayonet. Their duty is, in general, to protect the throwers.

In a frontal attack in the open they move on both flanks and protect the throwers by rifle fire.

In the communication trenches the riflemen precede the throwers and move around the angles of the trenches and the traverses, ready to stop any counter attack by use of rifle fire or the bayonet, or both. They also assist in determining the fall of grenades, help to correct the fire of the throwers, and signal when an advance is possible. When a further advance has become impossible the riflemen notify the squad commander. Without further orders a barricade of sandbags is built by all available men and the riflemen post themselves behind it, ready to fire.

In street fighting the riflemen watch especially doors and windows.

The throwers.—The throwers should, as far as possible, be expert grenadiers. They should have both hands absolutely free so as to be able to handle grenades with ease and safety. The throwers should not carry a rifle except when the grenade attack is but a prelude to some further enterprise in which rifles will be required; if the rifle is carried, it should be slung over the back during the grenade fight. The throwers should be provided with pistols and knives for their personal defense.

The carriers.—The carriers, one of whom is attached to each thrower, assure the supply of grenades, which they carry in baskets or bags, and which they pass to their throwers one at a time. The carriers replace the throwers when the latter fall.

March formation of grenade squads.—Grenade squads on the march make use of the usual formations for patrols and reconnaissances.

The squad commander takes the position from which he can best direct the movement of his squad.

The riflemen are disposed so as to cover the forward movement, the flanks, and to protect the grenadiers in case of an encounter with the enemy.

In the march on open ground the squads are in skirmish line, with the riflemen distributed along the line, but particularly grouped in the wings so as to protect the grenadiers. In case the enemy is encountered the riflemen who are scouting to the front take their places in the line.

In marching in communicating trenches, the squads move in single file, the order of march being as follows: Riflemen, throwers, carriers.

23—Squad Exercises:

In general, squad training may be said to consist of rehearsals of the various operations which grenadiers may be called upon to undertake in actual war. These exercises should always be carried out under conditions identical, as nearly as possible, with those to be expected in actual service; trenches should always be provided for instruction purposes. Instruction should be given at night as well as by day and under all conditions of weather.

In the European war zone all successful operations in grenade warfare will be found to have been rehearsed for several days. The most important grenade fight of which we have authentic accounts was rehearsed for about 10 days at a point some miles behind the lines, where special comforts were provided for the grenadier detachment, and where exact copies of the hostile trenches and nearby terrain were made from data obtained from aeroplane photographs and from two or three months of personal reconnaissance. The attack, which was preeminently successful, was not undertaken until every man could go through his part in it by day and by night without hesitation.

Squad exercises are carried out on a terrain specially prepared for the purpose. (See Training Fields.)

The squad will be instructed to divide itself rapidly into riflemen, throwers, and carriers, and will be taught the proper steps to take in the different circumstances of combat.

The men must always work in the greatest silence, communicating as much as possible by gestures and signals.

24—Organization:

Each platoon in a battalion should have a specially trained bombing squad of one non-commissioned officer and eight men, and should train sufficient reserves to replace casualties and main tain the squad at full strength. The four platoon squads in a together. In the trenches the company bombers are disposed of by the Company Commander as required, according to the scheme of defense laid down by the Battalion Commander. Squads should, however, remain with their own platoons as far as possible.

In addition, if desired and approved by the Divisional Commander, a separate battalion bombing platoon under the battalion bombing officer, consisting or not more than four bombing squads, may be formed and administered as a separate unit. If this organization is adopted, it should be universal throughout the division.

For the purpose of training in the actual technique of bombing, company squads may be grouped together under the battalion bombing officer when the battalion is in rest billets, but they must train with their companies when company training for attack and

defense schemes is in progress. For any particular operation, *e. g.,* a raid or general attack, when a special organization of bombers becomes necessary, a proportion of the company bombers may be withdrawn and specially trained under the battalion bombing officer for employment in the impending operation. The normal organization should be resumed when the operation is over.

Men employed as bombers must not be allowed to lose their efficiency in the use of the rifle and bayonet, or in the ordinary duties of the infantry soldier.

Squads of one non-commissioned officer and eight men will normally comprise two bayonet men, two throwers, two carriers (reserve throwers), one rifle bomber, one spare man (sniper or rifle bomber), and the leader (non-commissiond officer). The squad may be subdivided into two groups if necessary.

Every member of the squad should be thoroughly trained in the duties of every position, so that he can take any place in the squad. If this is done the composition of the squad can be varied to suit circumstances.

25—The Duties of the Various Men in Bombing Squad of 1 N. C. O. and 8 Men are as follows:

Nos. 1 and 2, "bayonet men."—These should be specially picked for pluck and alertness; they should be good snap shots and handy with the bayonet. Their duties in action are to attack the enemy with the bayonet and clear the way for further progress; and also to protect the men behind them by rifle fire, if necessary.

In the trench clearing they will be ahead of the throwers and work round each traverse in turn. It lies principally with the bayonet men to prevent the fighting becoming a mere grenade duel. Once the enemy is on the run, the bayonet men must give him no opportunity to halt and to commence throwing grenades.

Nos. 3 and 4, "grenade throwers."—These should be chosen for their coolness under fire and must be men who can be trusted not to get flurried or lose their heads. They should be picked men, thoroughly trained in accurate throwing, and have a thorough knowledge of grenades. These men should

be as lightly equipped as possible. They will require both hands to manipulate the grenade effectively.

No. 5, N.C.O. or leader. He is in charge of the whole squad and is responsible for controlling the fire, preventing indiscriminate throwing, and regulating the advance of the party. He will signal the progress of his party down a trench by flags or some form of flare signal. In action he will place himself where he can best observe the throwing and control the squad. In trench clearing he should usually be behind the first carrier.

He will personally inspect each man of his party before they start off on the task allotted to them. He will examine the arms of Nos. 1 and 2, and ensure that magazines are charged, that there is one round in the chamber, and that the bayonet is correctly fixed. He will see that Nos. 3 and 4 are correctly equipped, and that Nos. 6, 7, 8 and 9 have their full complement of grenades in the carriers, and that each grenade is correctly fused. He will make one man of the squad responsible for observation of the flanks and for giving immediate warning of counter-attack from the flanks, unless arrangement have been made for their protection by parties in rear. All men should know who will take No. 5's place if he becomes a casualty.

Nos. 6 and 7, the Carriers (Reserve Throwers).—They will keep watch on their respective throwers, and ensure that they always have a grenade handy when required. They must be particularly careful not to follow too close on the thrower lest they should embarass him in the act of throwing. They must be thoroughly trained in the duties of the throwers and be ready to take their place in case of casualties.

Nos. 8 and 9, Rifle Bombers.—Their duties are to outrange hostile bombers when there is any danger of the attack being checked and thus, when necessary, to cover the advance of the squad. They can also cover the flanks of the squad, when required.

The reserve bayonet man, if only one bayonet man is used in advance of the party, may act as sniper. The duties of the sniper are to keep down the heads of the hostile bombing party, to break their periscopes and thus prevent them from observing their fire, and to protect his own squad from hostile

snipers. If the rear men are bayonet men instead of rifle bombers, they may act as snipers, and will protect the rear of the party.

The following is an example of the method in which a grenade squad should be trained to work down a trench.

On arriving at traverse 2 (Fig. 8a) the bayonet men should place themselves in positions B1, B2, the first thrower at T1, behind the traverse, the first carrier immediately behind him at C1. The N. C. O. or leader at L in such a position that he can observe the fire and direct his squad. The leading rifle bomber should normally follow next behind the leader, who can then control both thrower and rifle bomber. The second thrower and carrier will follow next, with the second rifle bomber at the rear of the squad.

Crowding must be avoided, and if possible each man should be at a corner, round which he can move to a void a hostile grenade.

In support, further along the trench will be the blocking parties, riflemen, etc.

As soon as the bayonet men are checked, the leader will direct the first thrower to open fire. No. 1 thrower throws grenade as quickly as possible into the section of the trench held by the enemy; one bomb in the nearer end of the trench and one in the farther end.

On receiving the order *"Repart"* from the leader, the leading bayonet man moves forward to see into the next bay and the trench behind the next traverse. If they are clear he passes backward "Trench Clear" and the whole party work down the trench.

On reaching a branch or communication trench, or deep dugout, the leading bayonet man reports to the leader who decides on the action to be taken.

(*Note*: Every number in the squad should carry a proportion of smoke bombs for dealing with deep dugouts.)

The enemy once on the move should not be given time by the bayonet men to take a fresh stand. The bayonet men should always attempt to close with the enemy. A rapid and continuous advance is most likely to prove successful and grenade throwing should only be resorted to when the bayonet men are held up.

In the event of a communication trench being encountered, as in the plan given, another squad would be brought forward to work down it, the first squad proceeding along the main trench until the objective is reached. If no provision has been made for a second squad—the communication trench not being anticinated—the leader at once sends the second bayonet man, thrower

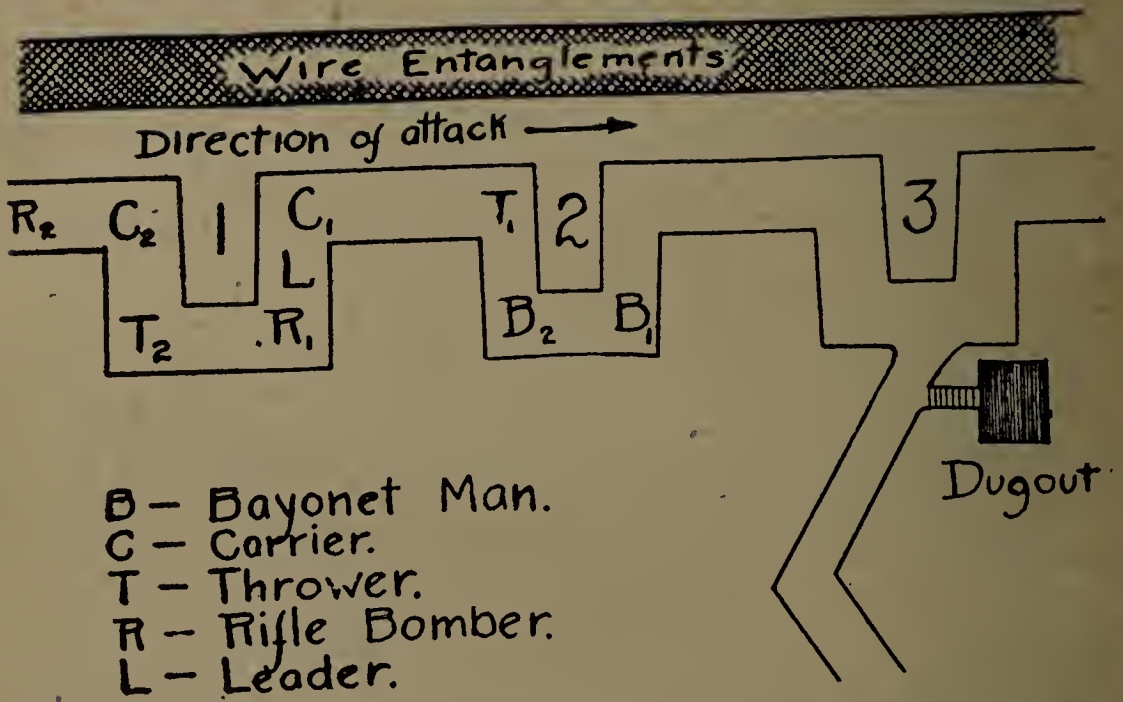


Fig. 8 (a)

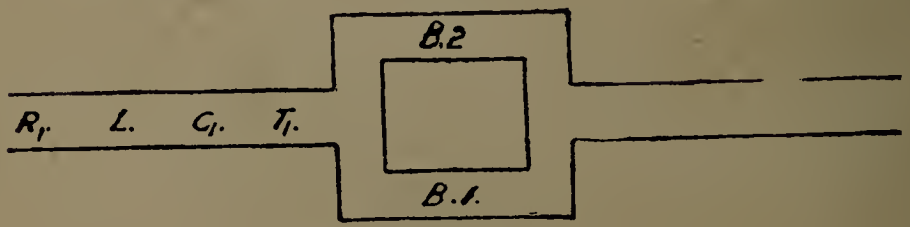


Fig. 8 (aa)

and carrier, to work down the trench in question accompanied by a blocking party, and riflemen if considered necessary.

Should an "island traverse" be encountered, the leading bayonet men must watch both sides of it whilst the grenadiers are throwing grenades. (Fig. 8aa.)

Rapidity of movement is essential. Crawling and stalking gives the waiting enemy advantage.

The leading bayonet men move along the trench from corner to corner, in a succession of rushes, followed by first grenadier and carrier, in a succession of rushes, followed by first grenadier and carrier. Grenadiers throw as directed by bayonet men. The duty of the leading bayonet men is TO PROTECT THE GRENADIERS AT ALL COSTS.

The second grenadier and second carrier follow leader, keeping one corner behind. If the first grenadier is put out of action the carrier takes his place until next grenadier comes up.

It should be borne in mind that this is a method that has been found to give excellent results, but is susceptible of changes, depending on the circumstances.

Extra equipment needed.—Gunnysack carriers, (improvise) dummy grenades, and flags or makers for squads in the trenches.

Each brigade has a bombing officer, who supervises the training of bombers in a brigade, holds periodical grenade exercises of a more advanced nature, and generally assists battalions. His chief duty in action is to insure a supply of grenades to battalions. He is assisted by a sergeant, who should be a thoroughly experienced bomber.

He should superintend the supply and care of grenades throughout the brigade, and should frequently visit battalions in the trenches to inspect grenade stores and bombing posts.

He is responsible, under the brigadier, for carrying out the standard tests (See Chapter X), and for the award of badges to bombers in the brigade.

PART 5.

27—Training Fields:

A practice field for each regiment should be constructed promptly by the personnel of the regiment near its rest camp or billets. Such a field for throwing dummy grenades only may be made a very simple affair. A sketch of a suitable arrangement is shown in figure 9. This is intended only as a suggestion, and any other arrangement answering the same purpose is permissible.

The trenches may be actually constructed or simply indicated by lines marked on the ground; a traverse or screen should always be provided in order to insure that grenades are thrown at high angles so as to give a plunging fire.

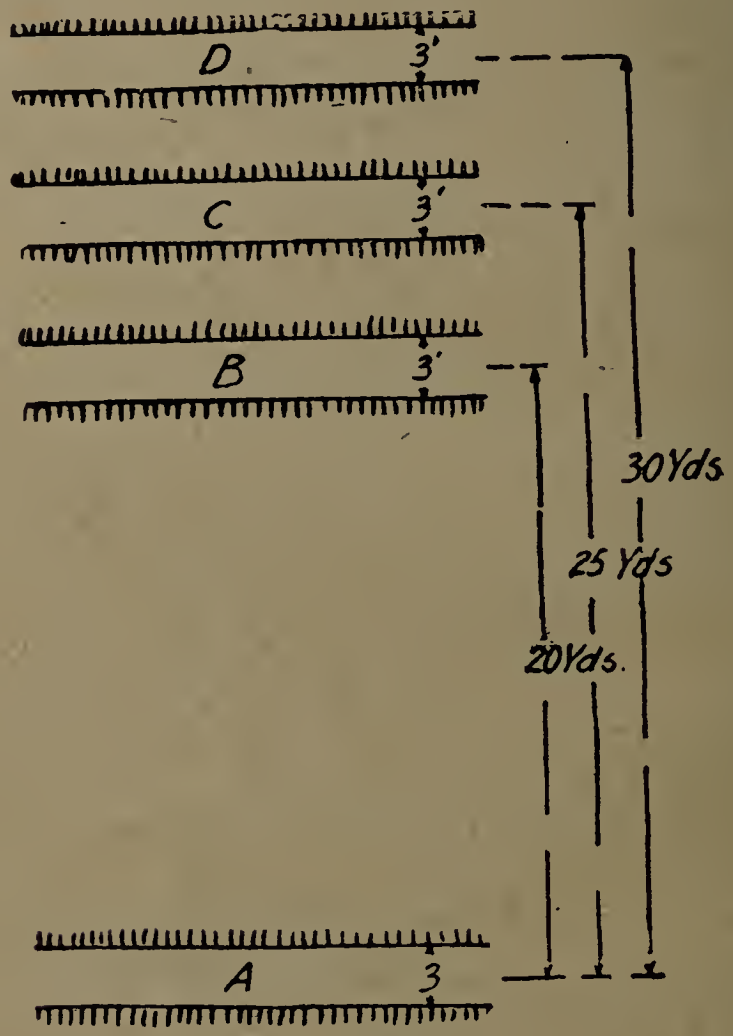


Fig. 9

The throwers take a position in trench A and practice throwing dummy grenades into trench B, afterwards increasing the distance so as to reach C, and then to reach D. The men may be divided into two parties, throwing to each other from opposite

ends of the practice ground, in friendly contest, so as to increase the interest as well as to save time. Targets may be constructed or outlined so as to give practice in throwing for accu-

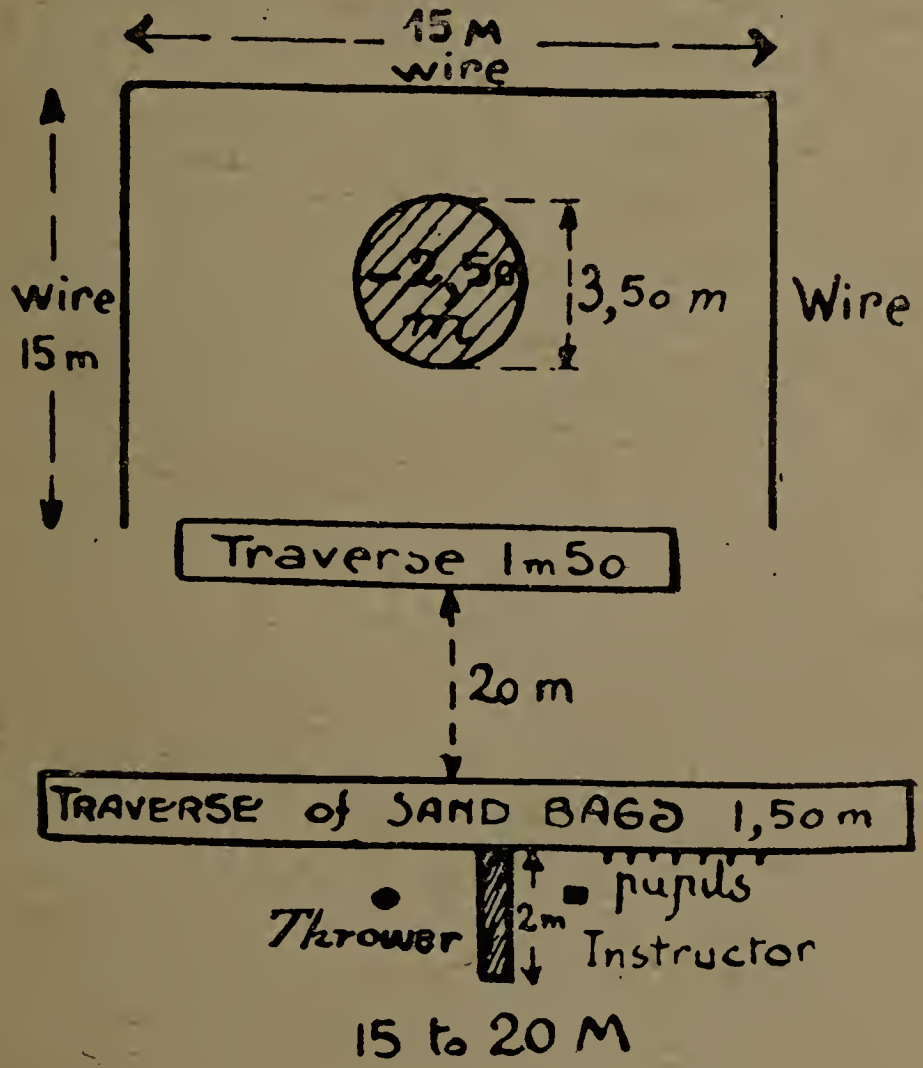


Fig. 10

racy. The men must be required to throw from different positions —standing, kneeling, and lying down.

The regular form of instruction field should be constructed when troops are to remain some time in any place, and such a field is absolutely necessary if practice is to be had in throwing

live grenades. This involves the building of fire and communicating trenches, machine-gun emplacements, shelters, traverses, barbed-wire entanglements, barricades, protecting screens, etc.

The establishment of an instruction field requires the construction of:

1. About 200 yards of trenches with traverses, communicating trenches, and shelters.

2. A hole to serve as a target for throwing live grenades. This hole should be about 8 feet deep and 12 feet in diameter. It is also well to surround it with barbed-wire entanglements, about 18 to 20 yards on a side, so as to prevent the handling of unexploded grenades by men not skilled in their manipulation. At some distance from this hole and on the same side as the trench from which the throwing is to be done, a 6-foot traverse should be built. The throwers should be sheltered in a trench or behind a wall with traverse. (Fig. 10.)

3. About 30 yards of trench, in zigzag form, with circular traverses.

4. Two shelters to protect against humidity, 100 yards apart, one for grenades, the other for detonators.

PART 6.

28—Notes on Grenade Training:

Every Infantry Soldier should receive elementary instruction in grenade throwing. All men will not develop into expert grenadiers, so the advanced training is reserved for those who show special aptitude. However, as the candidates will be called upon to develop the grenadiers in their own organizations it is essential that each and every one of them get as much instruction as can be crammed into the short time available for this important part of the camp work.

The object of elementary training is:

1st. To give the individual a practical knowledge of the working of the grenades in use.

2nd. To teach him how to throw them.

3rd. To make him acquainted with the general principles of organization and the execution of a grenade attack, either as a separate operation or as part of a general attack.

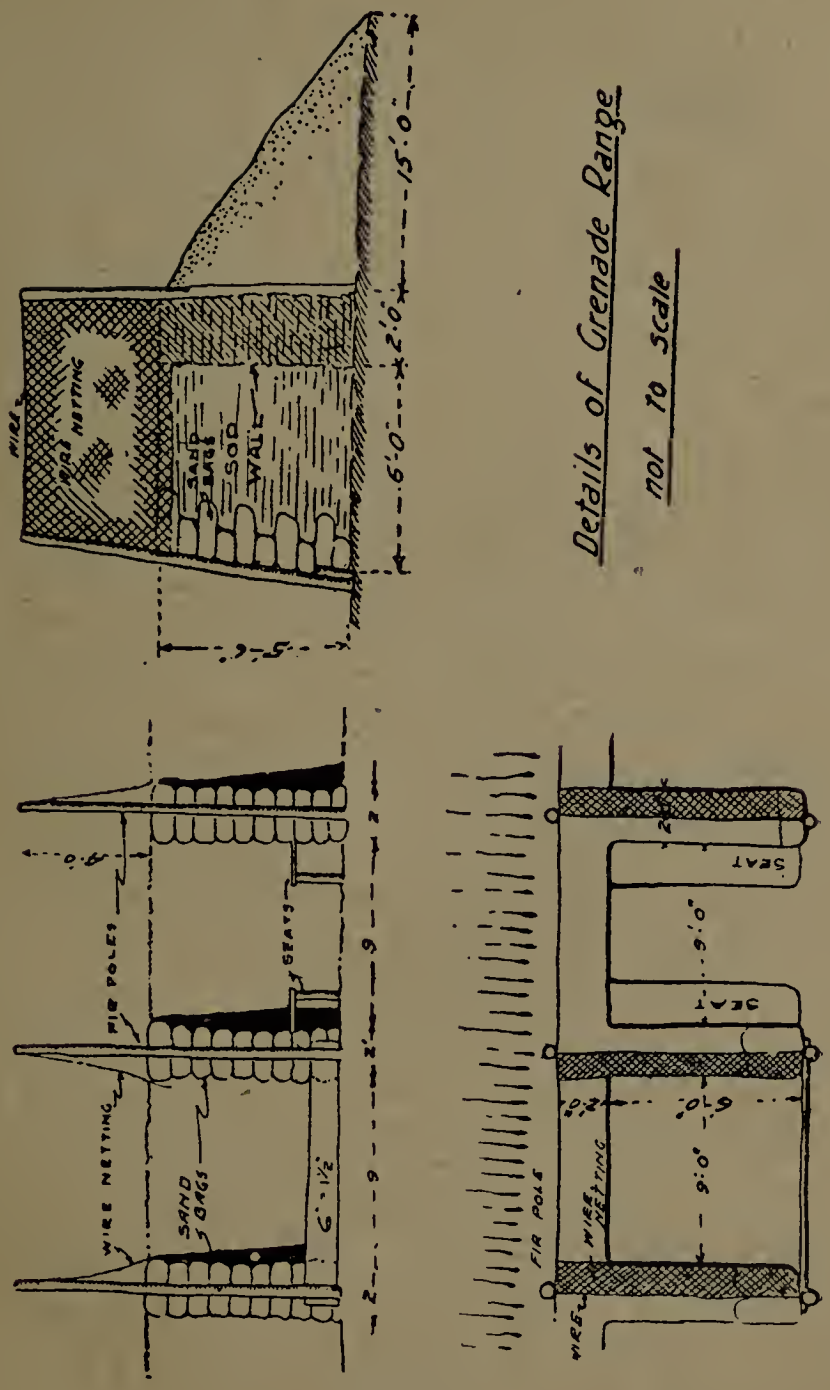

Details of Grenade Range
not to scale
WIRE
RAB NETTING
SAND BAGS
SOD WALL
15'0"
2'0"
6'0"
9'5"
0'6"
FIR POLES
SEATS
WIRE NETTING
SAND BAGS
6'1½"
9'
2'
SEAT
9'0"
FIR POLE
WIRE

Fig. 12

Accurate throwing with dummies and a working knowledge of the mechanism of the grenade that will be met with, should be acquired before the soldier is competent to work with live grenades of a similar type. Ordnance Pamphlet No. 1741 covers the subject of the U. S. Ordnance Department types. This pamphlet has been furnished all organizations. Dummies have been shipped by the Ordnance Department and will be issued to organizations upon receipt. The Mills No. 5 grenade has practically supplanted all other grenades in the British Service. Its advantages for the work in hand make it necessary that the American infantry be instructed in its use. Dummies have already been supplied to the organizations. Details of construction will follow.

Emphasize the necessity for care in handling the percussion grenade, especially in heat of action. Accidental dropping, or the striking of the rear wall of the trench, or the striking of the trench, or the striking of a member of his own squad while the grenade is in his hand will have all the effects of a well placed enemys grenade. On the other hand men should be taught that, if a grenade with a time fuse like the Mills No. 5 is dropped in time act of throwing, there is ample time to take it up and throw it out of the trench before it explodes. This, of course, must be done immediately.

Men must be taught to throw from a standing, kneeling, and prone position, though the latter position will be seldom used. Distance is important in grenade throwing, BUT ACCURACY IS ESSENTIAL. Bad direction results in waste of grenade and give confidence to the enemy. Men must be taught to throw at a definite mark at a known distance even in the stages of preliminary practice in the open.

There should be in every platoon at least one non-commissioned officer and eight (8) other men trained to the highest degree of proficiency. These men are available for work with others of the company or to provide a reserve of bombers for any special object. In each platoon there should be sufficient trained reserves to replace casualties and maintain the squad at full strength at all times. The squads in the company form the company bombers, and must be trained to work together. In the trenches the company bomber are disposed of by the company commanders as required, according to the scheme of de-

fense laid down. Squads should know however, remain with their own platoons as far as possible. In the British service some battalions have in addition a platoon of battalion bombers trained and administered as separate a unit of the battalion organization.

Men employed as bombers must not be allowed to lose their efficiency in the use of the rifle and bayonet, or in the ordinary duties of the Infantry Soldier.

In the British service squads of one non-commissioned officers and eight (8) men normally comprise two bayonet men, two throwers, two carriers (reserve throwers), one rifle bomber, one spare man (sniper or rifle bomber), and the leader (N.C.O.). The squad is thoroughly trained in the duties of every position so that he can take any place in the squad. When this is done the composition of the squad can be varied to suit circumstances.

Suggestions as to practice in throwing bombs: Squads can be divided into two groups of four men, one group returning the dummies of the first group. By these means no time will be lost and every man will be kept interested. As soon as a man has obtained a certain amount of proficiency in throwing in the open, he should next be practiced in throwing from behind cover, which is the normal condition under which grenades are thrown in action. This cover is simulated with a canvas or gunny sacking on the chicken wire screens which the organizations now have. Throwing cages may be used and will assist materially in attaining the proper throw. No man can use a side swipe when throwing from a throwing cage. These cages can be improvised similarly to those near Barracks 35. The following is suggested as one type.: Four corner posts which project seven (7) feet above the ground, the sides can be made of wire netting, boards, or such other material as may be available. The front face should preferable be boarded; the top 1½ feet arranged so as to be removed six inches at a time. This permits of the thrower throwing over four different heights, by removing one or more boards. The thrower stands inside the cage and throws over a front face. Length of cage from 6 to 10 ft., width from 3 to 4 ft., Rear to be opened to facilitate passing in and out.

When indirect fire (fire from behind the canvas screen) is taken up, an observer is used to correct the thrower's aim.

It is believed to be the better practice for the observer to give definite instruction for correction as "....yds. right" or "....yds. left" to correct direction, or "lengthen ....yds." or shorten.....yds." to correct the distance.

Great stress must be laid on throwing discipline. One well-placed grenade is worth any amount of grenades thrown indiscriminately. And in this connection the necessity for using the straight-arm, overhead throw, and not the baseball throw is again brought to the attention of all.

29—Grenade Organization:

The extensive use of grenades has been revived in the present war. With the adoption of Trench Warfare it was discovered that while the fire of the modern high-powered rifle is of little value in assaulting strong trenches, the fire of the grenade is very effective, so much so that the grenade is now considered a NECESSARY AUXILLIARY OF THE EQUIPMENT OF EVERY INFANTRY REGIMENT.

The grenade now plays almost as an important a part in Trench Warfare as the rifle.

All infantry units are instructed in grenade throwing or bombing and the specialists of this class are generally in the advance wave of the attack. The Trench Mortar has also come into general use in the Trench Warfare. It is fairly accurate and very effective against personnel and material.

The French Infantry Company consists of 194 men; 168 of these make up the fighting unit proper, the balance being specialists such as drummers, bombers, cyclists, signalists, etc. In each 168 men (the fighting unit) there are 36 bombers, 16 rifle grenadiers and 8 grenade carriers, a total of 60 men or very nearly 36% devoted to grenade work. These men are divided equally among the four sections that comprise the company.

Both in offensive and defensive the machine guns and 37 mm. guns are necessary compliment to the other armament of the infantry. These in conjunction with the automatic rifles grenades compel the enemy to remain hidden in his holes and trenches while the bayonet men, trench cleaners, and bombers are rushing forward to engage in hand to hand fighting. The machine guns, automatic rifles, and 37 mm. guns, having a flat

projectory, sweep down any objectives emerging from the ground. The hand and rifle grenades, having a high projectory, can reach the trenches and any objective underground.

In the attack the section is in two lines or waves; the first wave consisting usually of grenadiers and automatic riflemen, the latter in the center, and the second wave or riflemen and rifle grenadiers, the latter in the center.

The section is thus capable of becoming completed engaged in case it should come in contact immediately with the enemy, since the rifle grenadiers are placed at sufficient working distance to the rear of the first wave, and the automatic rifle men can instantly reach any enemy in movement on the open ground.

If the terrain is cut up by woods, villages, etc., the proportion of grenadiers may be increased by taking them from the sections in support and the automatic rifle men sent back to 2nd wave—the object being to use the grenades in the close fighting.

If an attack is made in the form of an assault, certain fractions detailed to clean up the enemy trenches, called trench cleaners or "moppers up" usually march immediately behind the leading sections and may be taken from the support sections. They are armed with pistols, rifles, and hand grenades.

If the attack takes the form of gradual progression the echeloning of the sections is made according to the same principle, but the special detail of trench cleaners, is unnecessary, as the trenches are cleaned up by the same troops that took possession of them.

The soldier specialists such as grenadiers, automatic rifle men, ammunition carriers, rifle grenadiers and trench cleaners carry only the weapons or munitions of their specialty, and otherwise have their loads lightened.

During the attack as the leading wave approaches the first lines of trenches to within throwing distance, grenade fighting begins and is kept up until the trenches and approaches are cleared of the enemy. The advancing lines make use of shell holes or any depression or other place offering any concealment or protection in the advance to the assault or from trench to trench. This must be done step by step with great caution in order to minimize losses caused by enemy's grenades and by traps, fougasses, etc.

Grenades are thrown ahead so as to gradually clear the approaches, and when a lateral trench is reached, several grenades are thrown in each direction, right and left.

The grenadiers are assisted by the automatic rifle men, who fire on any of the enemy attempting to advance along the approaches, and when the enemy is overwhelmed they move forward and clear the way for the further advance of the grenadiers, who in turn bombard the next section of the approaches with grenades. When the first wave reaches the objective it is joined by a half-section of riflemen who immediately organize the captured ground and prepare it for defense against counter-attack.

The British organization has been cited heretofore. In the British assault each wave is assigned to its own objective. The first wave is composed of bombers and rifle grenade men, and attack the enemy's first-line trenches. It must go straight through to its objective following the artillery barrage as closely as possible. Intervening hostile trenches must be crossed as quickly as possible, the line reformed on the other side, and the advance resumed. The second and third waves composed of riflemen with and Lewis guns, reinforce the first wave after the latter have occupied the enemy's first-line trench and attack the enemy's second-line trench. Bombing squads (one N.C.O. and 8 men) are on the flank of each attacking wave, where there are special battalion bombers there are assigned some specific task.

"Mopping Up" parties upon arriving at their alloted trench must at once dispose of any occupants who may have emerged from their dugouts, and picket the dugout entrance to prevent any more coming out, then clean them out with grenades, while other parties are sent to clean the approach trenches forward as far as the next line trench.

In the British service the ultimate unit in the assault is the platoon. The platoon must be organized and trained as a self-contained unit capable of producing the required proportion of the riflemen, bombers, rifle bombers, Lewis gunners, carriers and runners trained to work in combination.

In consolidating a position taken, approach trenches running towards the enemy must be blocked and hand and rifle grenadiers posted to guard them.

The German organization has many points in common with the British, and captured documents indicate a marked similarity in the training course.

CHAPTER II.

PART 1.

TACTICAL EMPLOYMENT OF HAND GRENADES IN THE DEFENSE

There are no set rules for the tactical employment of grenades, and, from the very nature of the case, no such rules can be formulated. Every problem must be considered separately, the terrain and the enemy carefully studied, and most careful and detailed preparations must be worked out in advance. The men must be well trained in throwing grenades and must be daring and resourceful. Most of the work must be done under cover of darkness.

Theoretical and practical instruction should be given in the following:

Defensive.—Defense of a trench by grenades, including the location and construction of emplacements for grenadiers, niches for grenade depots, and barricades against grenades.

Offensive.—1. Advance in, and step by step defense of, communication trenches.

2. Assault of a trench with grenade preparation of the assault.

3. Cleaning up of a trench, taking it by the flank, including measures of security during the operation.

4. Execution of sorties.

The instruction should also include formations for marching in open terrain by night and by day; methods of making a rapid approach to hostile trenches after preparation by artillery and trench engines; surprise attacks at night.

The organization of grenade supply should be part of each exercise.

30—Employment of Bombers in the Defense:

The main infantry defense of a line of trenches against hostile infantry will be by rifle and machine gun fire. Parties of

LIBRARY
UNIVERSITY OF ILLINOIS
URBANA

bombers, however, may be distributed throughout the front system of trenches for special purposes. Except in those parts of the line where the enemy's trenches are within grenade-throwing range, bombing parties need not actually be located in the fire trenches. The best position for them is in the support trenches close to the main communication trenches leading to the fire trenches, whence they can make an immediate counterattack should the enemy succeed in gaining a footing in the front line.

A "trench" or "bombing pit," dug about 20 yards behind the front trench, from which grenades can be thrown into the front trench, is an advantage.

Where mine craters, sapheads, hollows, etc., provide ground which neither rifle nor machine-gun fire can cover, bombing posts should be established so as to deny such points to the enemy. These posts should be sheltered as far as possible from enemy grenades by wire netting and small traverses.

Saps forward from the front trench should be covered to beyond grenade-throwing distance from the front trench with a network of overhead wire of about 1 foot mesh. This will prevent parties of the enemy who may capture the sap from throwing their grenades into the front trench, but will not prevent the grenades of the defenders from falling among the enemy in the sap. The head of the sap should not be wired, so that when it is occupied by the bombers of the defense they can throw their grenades from it to both front and flanks.

Unless a sap is within grenade-throwing distance of the enemy, occupation by bombers is not necessary; but a bombing post should be established in close proximity to all saps.

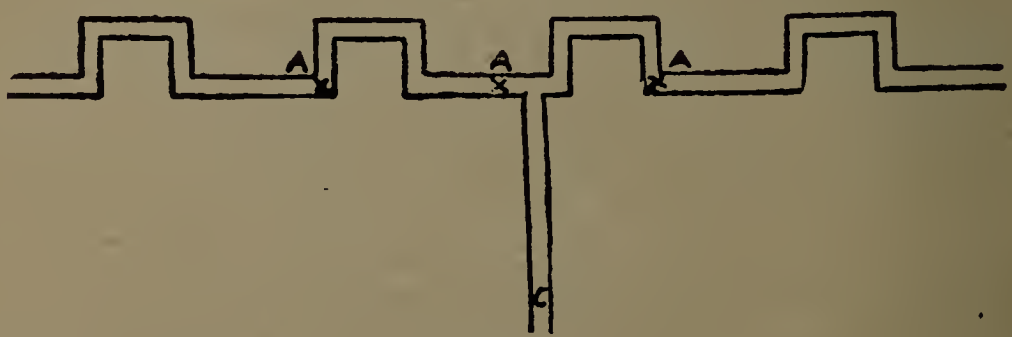


Fig. 13

Bombing posts at A, A, A, can all throw into C simultaneously.

The trident trench as a means of defense has already been referred to. A similar arrangement can be carried out for the defense of a mine crater or at any point where a communication trench joins a main trench, e. g.,

The action of bombing parties should be laid down in the scheme of defense of each section of the line, and each party should be practiced in carrying out its particular rôle, so that every member of it may know what he has to do.

It is essential that a counterattack by bombers should start immediately, before the enemy has had time to arrange his defense. In the case of small counterattacks from the support trenches, the bombing squad, which should be permanently stationed close to the communication trench, moves forward at once, followed by the remainder of the platoon. If it is necessary on reaching the fire trench to turn outward and attack in both directions, every man must be detailed beforehand as a right-hand or left-hand man.

In the case of a counterattack on a bigger scale from the reserve trenches, a properly organized column with point, support, side parties, and main body must be detailed. The men should be told off beforehand and stationed in the order in which they will advance, i. e., with the point nearest the communication trench. The attack can then be launched at a moment's notice. The men file into the communication trench in order, taking their grenades from the grenade stores as they pass. These grenade stores should be established at the junction of each communication trench with the reserve trench. The grenades should be kept ready packed in carriers.

A counterattack across the open can often be prepared and supported with effect by the fire of rifle bombers.

31—Blocking Trenches Against a Grenade Attack:

All bombers must have a knowledge of the best methods of blocking a trench. In all attacks they should be supported by a party of men with sandbags and tools, under an experienced non-commissioned officer, so that, while the bombers are keeping the enemy at bay, a strong barricade can be built as quickly as possible.

It is advisable to work along the trench for a distance of 50 yards or so farther than the point to be barricaded in order to

drive the enemy back out of grenade-throwing distance. A second barricade of a temporary nature should be erected at this advanced point, and constant fire kept up by the bombers, while a working party fill in the trench between the advanced and near barricades as rapidly as possible, placing wire in it to hinder the enemy from digging it out. It is advisable, as a rule, to attach a small number of engineers to the party, with a view to blowing down the enemy's trench by explosives. As soon as a clear field of fire has been established from the point to be held, the bombers retire from the advanced barricade.

In making a permanent barricade, provision must be made for dugouts for the bombing party and riflemen. The best form of dugout is one built off the main trench in a T shape. This should be protected from counter grenade attacks by wire netting, and a grenade depot should also be built.

A "blocking-gate" device is shown in plate A.

It is of advantage to dig a sap leading toward the enemy from each side of the trench which has been blocked, somewhat in the form of a "trident." Grenades can thus be thrown into the blocked trench from three points simultaneously. (See Fig. 14.)*

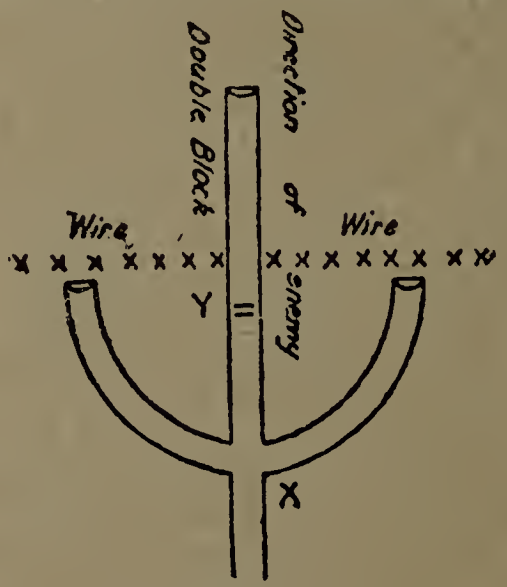


Fig. 14
The point X, where the saps branch off, should be out of grenade-throwing distance from Y, the rear block.

* A straight trench can be used in a similar way.

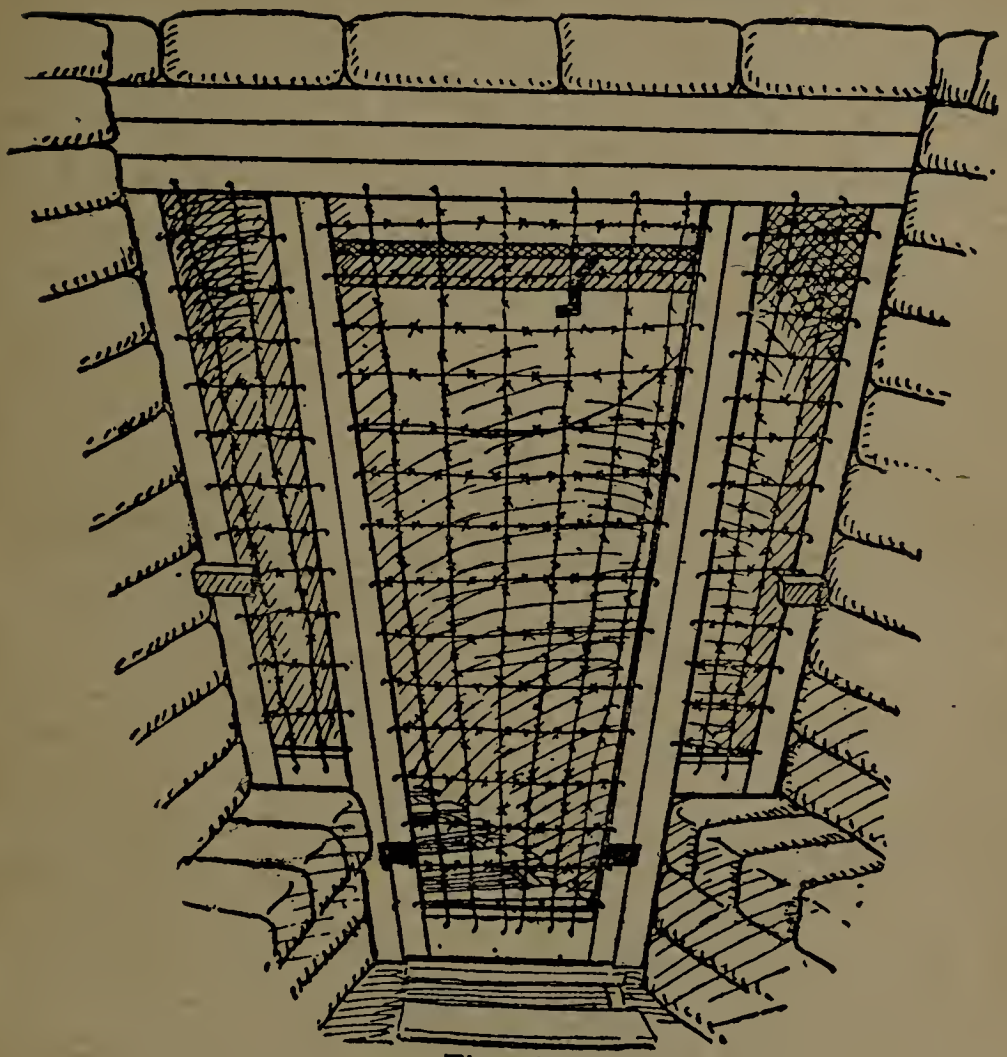


Fig. 15
Blocking Gate

There are two main types of trench which it may become necessary to block:

(a) The winding communication trench, down which it is impossible to fire.

(b) The straight trench with traverses, along which it is possible to fire when the traverses are destroyed.

(a) To block the winding trench effectively, a section of it must be absolutely destroyed. The length filled in should be

sufficient to give the defence ample time to shoot any men attempting to rush across the gap. An obstacle should be placed across the destroyed portion and continued by 10 yards or so on either side. There is no object in filling in the trench for a greater distance than it is possible to throw a grenade, as it would

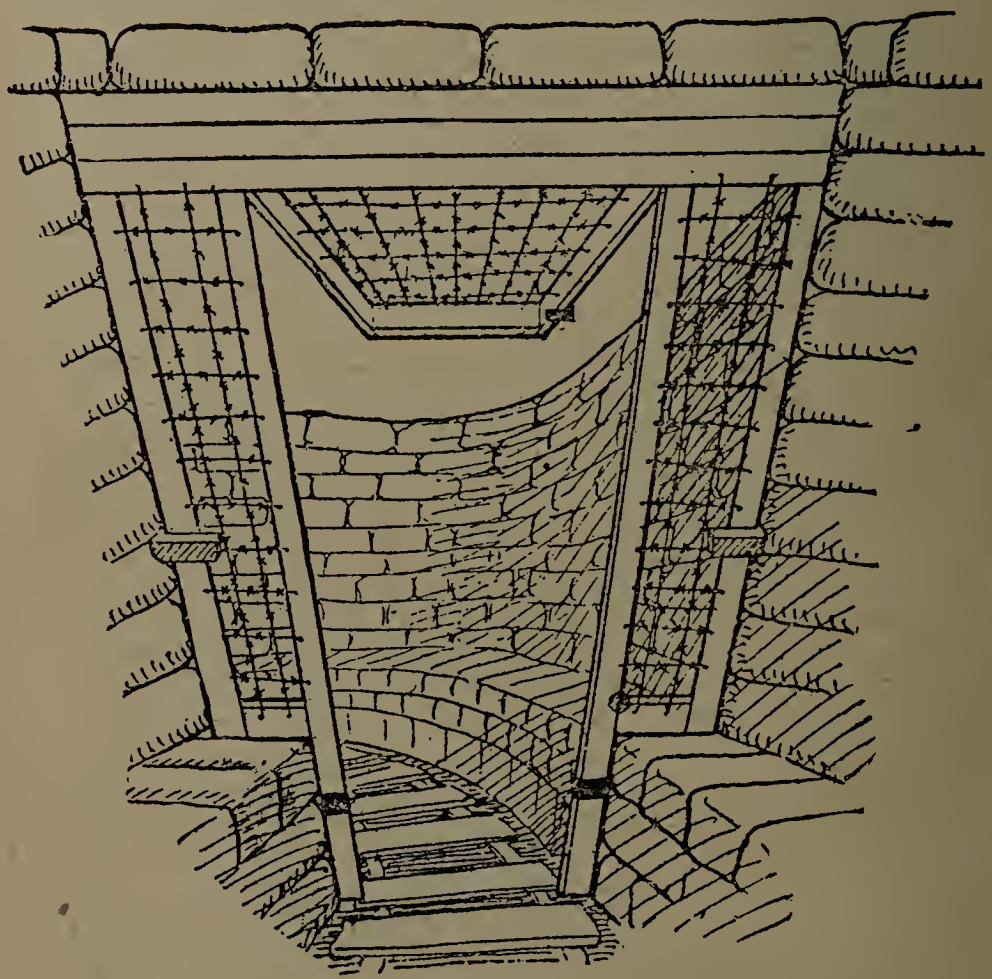


Fig. 16

only be dug out again by the enemy up to the point where our grenades become effective. A barbed-wire knife-rest or similar object placed in the trench before it is filled in will considerably increase the difficulty of any attempt to dig out the destroyed portion. (See Fig. 17.)

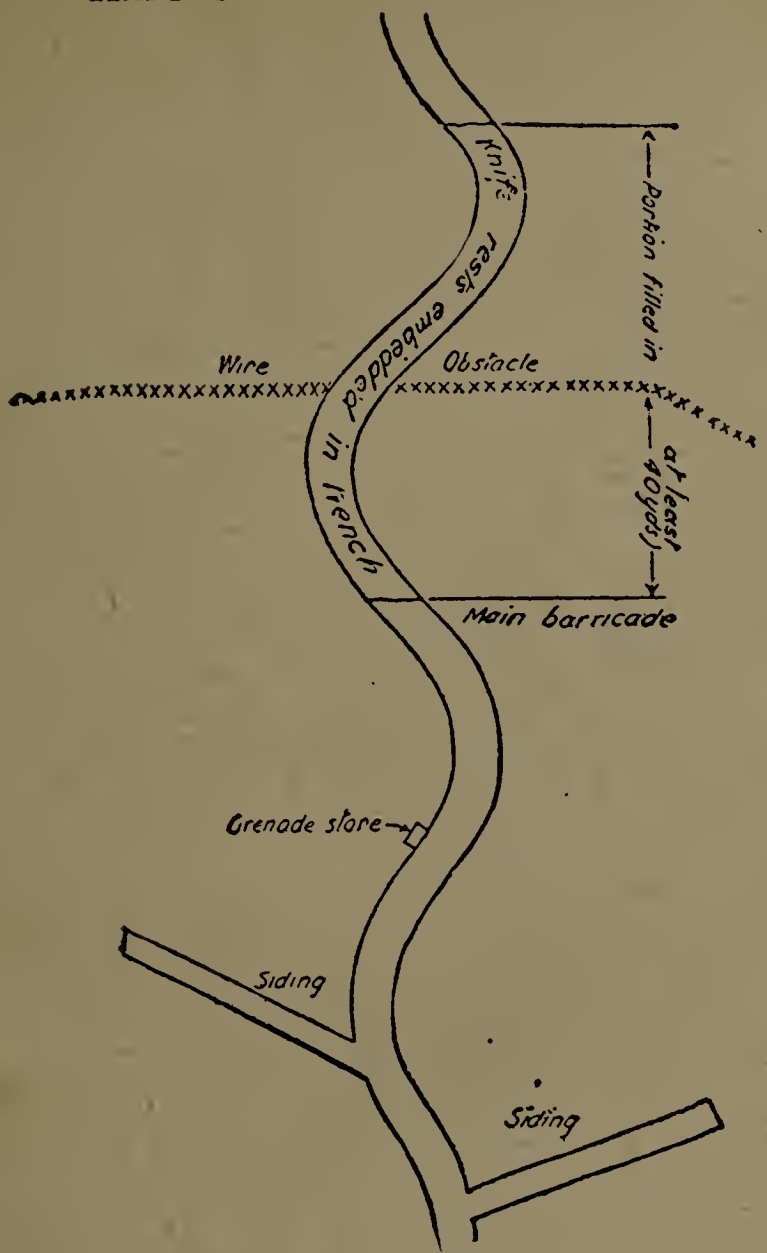


Fig. 17

When gate is open it rests on a hook. This hook can be pulled aside from a distance by a wire or chain. The gate is self-locking and can be opened only from the side of the defenders.

A simple swing gate, that is, one swinging horizontally instead of vertically as shown in the above plate, is preferable.

Should it be possible to fill in only a short length of the trench (15 or 20 yards), the bombers should be stationed close up to the destroyed portion, where they would be constantly exposed to grenades. They should be stationed sufficiently far back to be safe from grenades thrown by men at the enemy's end of the blocked portion. From this position they can occasionally run up and throw grenades into the trench beyond the gap. Any attempt on the part of the enemy to dig out their end of the gap should be met by vigorous and continuous grenade throwing until the digging ceases.

In order to guard against a rush across the gap, sidings at right angles to the trench should be made. A Lewis gun is very useful to cover the gap.

(b) In the case of a straight trench with traverses (fig. 18), the traverses in a portion of it should be cut away and the earth be used to fill the recesses. A strongly built sandbag breastwork is then made across the trench, with loopholes for observation and fire. The trench behind the breastwork is roofed over to give protection from grenades, with a traverse to protect the men from grenades which burst beyond them. To hinder any attempt of the enemy to rush across the cleared portion of the trench, loose strands of wire should be placed in it. A Lewis gun, if available, can be mounted in the breastwork. In order to guard against damage to the breastwork by grenades continually being thrown against it and bursting at the foot of it, a catch pit can be dug, into which they would roll before bursting.

Sidings should be made as before.

In making a block in a communication trench, care should be taken to level off the earth on either side of any portion of the trench held by us within grenade-throwing distance of the enemy, in order that badly thrown grenades may not roll down the slope into the trench (see figs. 19 and 20).

PART 2.

32—Defense of a Trench by Grenades:

The grenadiers are divided into small groups of two or more squads along the line; their number is increased along the most exposed fronts, such as salients, parts very close to the enemy's

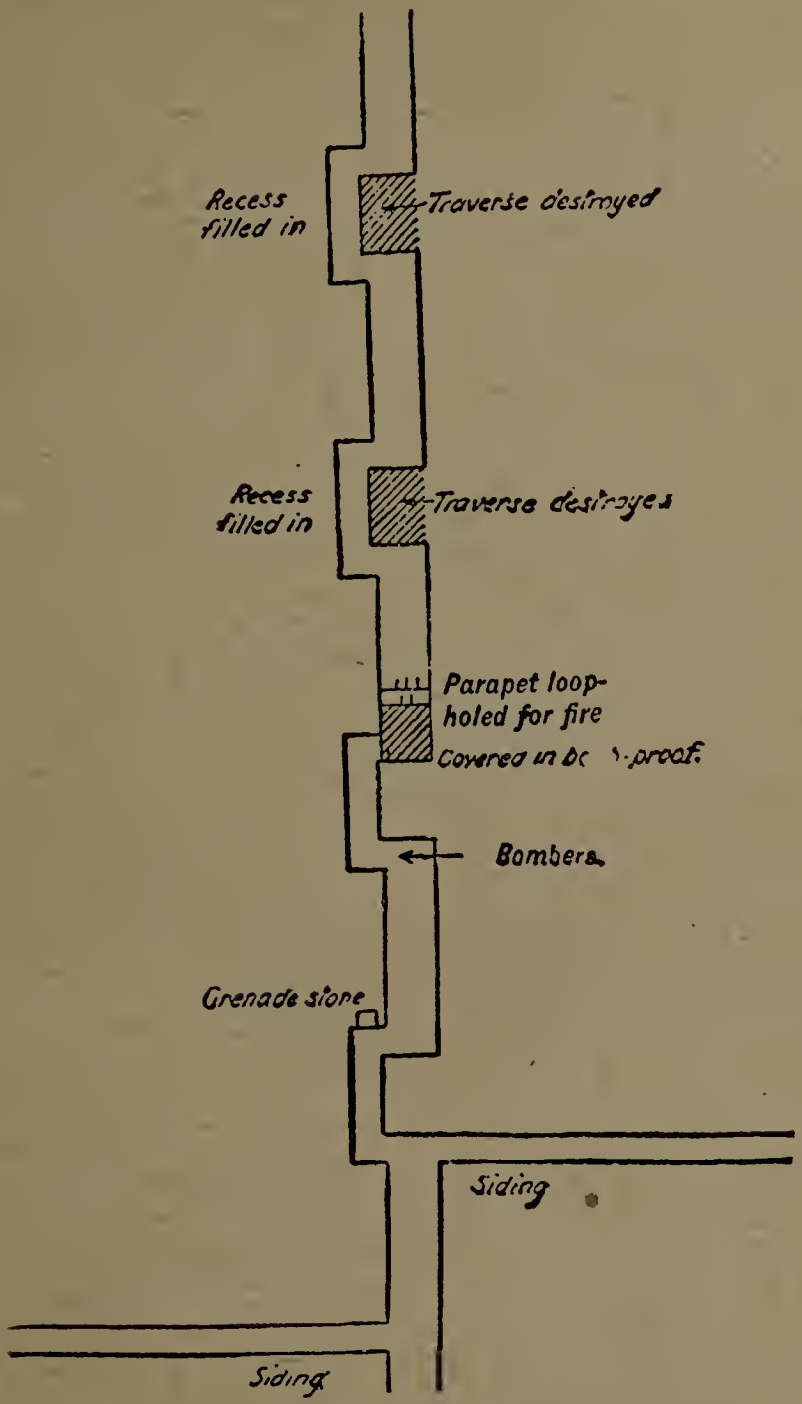

Recess filled in
Traverse destroyed
Recess filled in
Traverse destroyed
Parapet loop-holed for fire
Bombers
Grenade store
Siding
Siding

Fig. 18

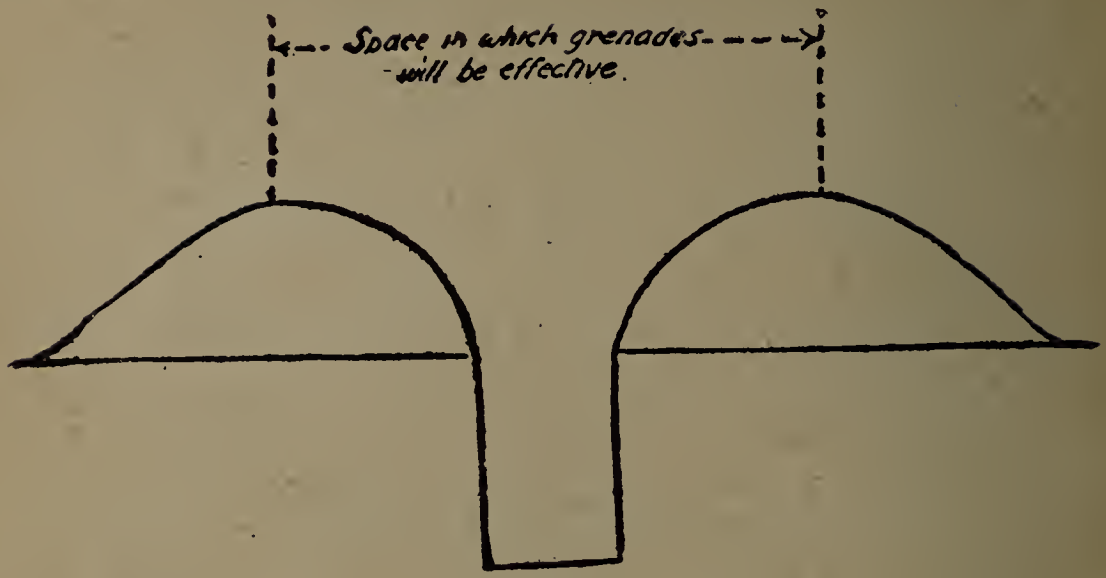


Fig. 19
Usual Form of Communication Trench

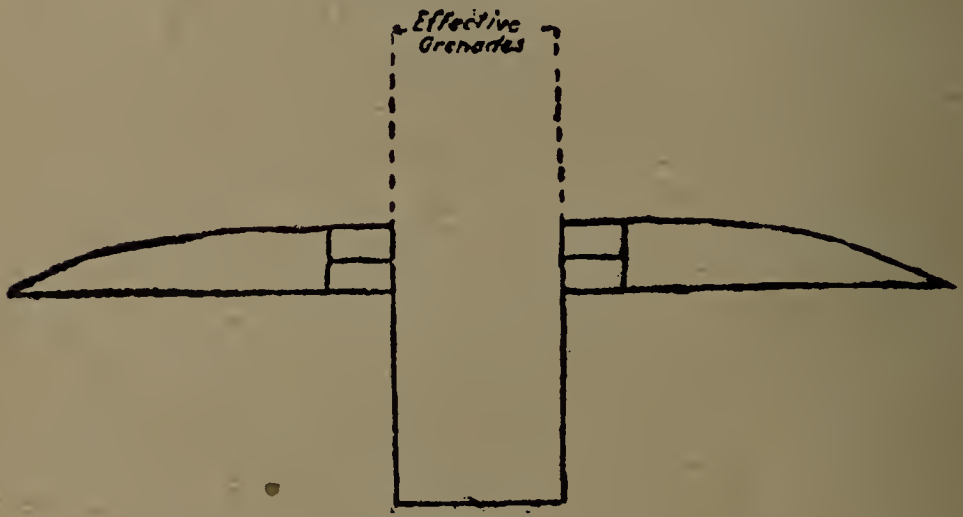


Fig. 20
Trench with Earth Levelled Off

trench, etc. It is well in this case to double these trench elements by other trenches very close to the first, so as to form, to a certain extent, two ranks of grenadiers at these points.

In order to avoid the daily losses where the trenches are very close together, superiority in grenade throwing must be obtained and maintained so as to make it impossible for the enemy to stay in his trench.

Emplacements for grenadiers and depots for grenades will be provided in the "double" trench, at the entrance to the communicating trenches, and in shelters along the course of the communicating trenches in such a way as to permit an exit in case the trench is invaded by the enemy.

The different groups must be exercised in the rapid organization of counter attacks with the grenade so as to retake any part of the trench which may be lost.

The best weapons for repelling an enemy attack are machine guns and rifles. Grenades with time fuses, thrown at the enemy at the moment when he rushes forward to storm the trench, often explode only after the enemy has passed them, thus causing no damage. The use of grenades is of importance only when firearms can not be used, or when the enemy entrenches near our own positions, in dead angles, in shell craters, etc., or when the enemy has penetrated to some point of our own trenches.

Experienced grenadiers should, above all, be stationed at the exits of the communicating trenches, in the combat trenches (barricaded), in the neighborhood of the flanking machine guns, and in the vicinity of the Company Commander or of the Platoon Commander, to act as reserves.

Hand grenades should be distributed accordingly, but provision should be made so that they can be rapidly obtained in all other parts of the position.

The first supply, consisting of primed grenades, is placed in hermetically sealed boxes, which are deposited in a recess, supported by wooden planks, in the interior wall of the trench. In case of a critical situation, it is best to distribute grenades to all men stationed in the first line. The advance post and patrols always receive grenades.

Other supplies of grenades should be deposited in the positions and lines to the rear, and in the recesses and places under fire. It is necessary to indicate in an exact manner, and recognizable even at night, the path to be followed in reaching these depots.

Hand grenades should be deposited in sufficient quantities in the subterranean shelters for the picket detachments and the

reserves, so that the troops will not lack them for counter attacks.

The observation and combat posts, the positions of the close defense guns, the batteries, the position of trench mortars and others of like order, receive for their own defense a suitable stock of grenades.

PART 3.

34—Warning:

1. Remember that the hand grenade is always loaded and cocked. It is always pointed at you. It is a dangerous weapon unless properly handled. You will minimize the chances of injury to yourself and comrades if you bear this constantly in mind.

2. The detonator or firing device is dangerous by itself. It is powerful enough to blow one's hand to pieces.

3. Do not use live grenades until you are thoroughly familiar with their every detail, and until you have had practice with dummy and practice grenades.

4. In practicing, never throw a live grenade unless cover is at hand, behind which the operator and spectators may seek shelter. The effective radius of the grenade is 75 yards.

5. Do not arm the grenade by drawing the safety cotter pin until you are ready to throw the grenade. If the grenade is dropped after removal of the cotter pin, assume that it is going off. Do not wait to examine it, but instantly pick it up and throw it.

6. Do not assume that you can guess when five seconds have elapsed.

7. If, in practice, a grenade fails, it should not be recovered until at least 10 minutes have elapsed. Any grenade about which there is any doubt is to be considered a misfire and to be treated as such.

8. Remember that the filling plug at the bottom of the grenade body is painted when the grenade is loaded.

9. Do not disassemble a grenade which has failed to go off. Let an expert do it.

35—Action of the Grenade:

The action of the grenade is as follows:

The striker is held in its position of full cock by the upper

end of the lever, the depression in the lever snapping over the firing point of the striker. The lever is kept from pivoting on the rivet by the cover, the notch in which fits across the upper end of the lever, the cover being kept in place by the safety split pin. The grenade will be received loaded and cocked; to arm it, all that is necessary is to pull out the safety split pin by means of the ring, and, holding the lever in place by grasping the grenade in the hand, shake or pull off the cover.

From this point on the grenade is armed and is ready to throw.

36—Operation of Grenade:

In a great number of the hand grenades used abroad the so-called Mills method of operation is employed. This principle involves the use of a lever which lies close to the body of the hand grenade and parallel to its longitudinal axis. The grenade and lever are grasped firmly in the hand and the cotter pin is withdrawn. As the grenade is thrown the pressure of the hand is released and the lever flies up, permitting the firing mechanism to actuate. This principle has this disadvantage: If the grenade be fumbled or accidentally dropped, or if the thrower be disabled, after removal of the cotter pin, the grenade immediately becomes a serious menace to everyone in the vicinity. In the hand grenade Mark 1 an attempt has been made to overcome this objectionable feature by the introduction of a mechanism which is automatically operated by the act of the throwing. It was noted that in the overhand throw the thumb passed obliquely over the body of the grenade, and that in the baseball throw the grenade left the hand. This fact has been taken advantage of in the design of the hand grenade with a view to overcome the fault inherent in grenades of the Mill type. It must be remembered, however, that this additional safety feature is not infallible and that the grenade, if accidentally dropped, may so fall as to actuate the lever.

Bombers will readily acquire the knack of operating the grenade with the overhand throw. If the grenade is held properly and the thumb pressed firmly against the lever, the lever will be tripped at the instant the grenade leaves the hand. The thumb, slipping along the lever obliquely as the grenade leaves the hand, turns it through some 20 degrees, and frees

the striker; the latter, operated by a rat-trap spring, flies over so as to strike the primer after perforation of the tin-foil disk which serves the purpose of waterproofing the grenade. The end of the fuse is tipped with a priming powder composition. This is ignited by the primer and causes the fuse to burn. At the expiration of five seconds the flame from the fuse spits into the fulminate composition causing the same to detonate. The detonating wave set up by the fulminating composition is conveyed to the surrounding bursting charge of high explosive and the grenade fragmented.

37—Detailed Description of the Grenade:

The grenade is about the size of a large lemon, designed to fit comfortably in the hand, and weighs, ready for use, about 22 ounces. The body (made of malleable iron, to secure better fragmentation than with cast iron, which tends to pulverize) is scored with deep grooves dividing it into 40 sections, further insuring proper fragmentation. The bouchon is a die casting holding the entire firing mechanism of the grenade; it upper part holding the cocking mechanism, consisting of striker, spring, hinge pin, lever, and cover; and its lower, tabular portion, containing the detonating group consisting of primer, fuse, and detonator. It will be noticed that the lower end of the bouchon tube is slotted; this is done to receive the fold of the detonator, which is crimpled over the fuse in such a manner that the diameter of the outside of the crimped portion is the same as that of the fuse. After the fuse has been primed and the detonator crimped onto the other end, they are placed in the bouchon tube as shown in the assembly drawing, and the portion of the tube over the detonator is tightly closed to make a tight joint. This is done to prevent any possibility of an instantaneous explosion due to the flame from the primer reaching the detonator without going through the fuse.

The lever striker and cover are of sheet metal pressed into form as shown. They, with the spring and hinge pin, form the cocking mechanism of the grenade. The detonating group consists of the primer, the fuse, primed on the top with a special priming composition to insure its ignition, and the detonator—a standard No. 6 fulminate detonator, 1¼ inches long. The fuse is a standard fuse, two inches long and timed to burn five

seconds, plus or minus three-fifths of a second. After the primer is in place a weatherproofing disk of tinfoil is placed over it and held in place by shellac on the shoulder of the bouchon. The grenade is further weatherproofed by means of cement between the bouchon and the grenade body and on the threads of the bouchon and of the screw. The screw will be daubed a special color when the grenade is loaded, the color varying with the particular explosive used.

CHAPTER III.

TACTICAL EMPLOYMENT OF HAND GRENADES IN THE OFFENSIVE

PART 1.

38—General:

The disposition taken for combat in trenches must be such as to avoid piling the men up. Only a minimum number of men must be exposed to hostile grenades, and these must have sufficient room for freedom of movement. This kind of fighting is very onerous, forw hich reason frequent relief must be provided; besides this, the group commander must be able to replace instantly all men put out of action and, when necessary, to reenforce the leading squad by new riflemen or throwers.

The most profound silence must be maintained, so as to hear all sounds coming from the enemy which may serve as indications; hence, communicate by gestures and signals.

Groups must not "bunch"; not more than three men should be in a single element of the trench at any one time. Advance prudently, keeping a sharp lookout for raps, fougasses, etc. The long straight portions of the trench are generally enfiladed by rifles or machine guns placed in the traverses. The enemy also often hides at the end of a blind lateral communicating trench, of which the entrance is sometimes masked, for instance, by a piece of painted canvas. If the advance is made too rapidly, the enemy may come out of his hiding place behind the group of grenadiers and cut it off.

39—Employment of Bombers in the Attack:

Bombers may be employed in—

(*a*) Local enterprises or raids, designed to inflict loss on the enemy but with no intention of making any advance or holding a captured trench.

(*b*) Local attacks made by bombers and supported by other in-

fantry, with the intention of capturing and holding some length of trench or position.

(*c*) General attacks on a large scale, in which bombers are allotted special rôles in conjunction with the main infantry attack.

The organization of parties and arrangements made will naturally differ somewhat in each of the above cases, but the principles remain the same and success will depend on—

(*a*) Careful preliminary reconnaissance and preparation.

(*b*) Every party being given a definite task and organized accordingly; every man in each party knowing his task and being trained for it; and sufficient trained men being in reserve to replace casualties.

(*c*) Accurate and disciplined throwing.

(*d*) Arrangements for keeping up a sufficient supply of grenades.

Generally speaking, in the attack, bombing is of value for clearing small lengths of trench and for close fighting after a trench has been rushed; but experience has shown that no great or rapid progress can be made by bombinb, and an assault across the open after adequate preparation will usually be a quicker and in the long run less costly operation than bombing attacks on a large scale.

40—Organization and Execution of a Bombing Attack:

When preparing a grenade attack a definite objective must be selected. An air photograph of the position must be carefully studied, and the best line or lines of attack be chosen. All side trenches must be carefully noted and definite orders given whether they are to be—

(*a*) Picketed by bombers and bayonet men as a temporary measure.

(*b*) Permanently blocked, in which case a working party, as well as the bombers and bayonet men, must be detailed beforehand.

(*c*) Used for a secondary attack, in which case a properly organized column must be detailed.

A separate party must be detailed beforehand for every side

trench. If the air photograph is not sufficiently clear, and side parties can not be told off for particular trenches, the parties should be numbered (No. 1 side party, No. 2 side party) and used as occasion requires.

Arrangements for dealing with dugouts must also be made. P. grenades are most effective against deep dugout* and a supply should always be carried by the leading bombers. Parties placed in close support should be detailed for the systematic clearing of a system of dugouts.

The protection of the flanks of a bombing attack by the fire of machine guns, Lewis guns, or snipers against a hostile counter attack across the open must always be arranged. Lewis guns can frequently accompany the bombing party. They may be able to enfilade some portion of a hostile trench; they can always assist in keeping down hostile rifle fire; and they will be available to defend the captured trenches or any block that may be made when the operations have come to an end.

Whenever possible Stokes mortars should be used to assist bombers. They should be so placed that they can bring a heavy, concentrated, and continuous fire on a point previously fixed in the enemy's trench, about 50 yards beyond the length to be secured by the bombers. The position of the mortars may either be in the trench down which the bombing raid is made, so as to give enfilade fire, or in trenches opposite the objective. A combination of frontal and enfilade fire should be employed whenever possible.

The following points should be attended to by Stokes mortar officers:

1. The target should be carefully registered before the operation commences.

2. Fire should be opened at the moment of attack, and continued until the piece of trench gained is consolidated.

3. A plentiful supply of ammunition should be at the mortars before the attack is undertaken.

---

* They usually set fire to and destroy the dugout, and should therefore not be used indiscriminately in captured trenches which it is proposed to hold, as our men will thus be deprived of the shelter of the dugouts in a subsequent hostile bombardment.

The Stokes mortar can also be used to fire ahead of bombers as they proceed down the trench, but this method should only be employed when observation is so favorable that the Stokes mortar officer can make certain that he can follow the movements of the bombers down the trench. Rifle bombers, using the Mills rifle grenade (No. 23) are more suited for close support in this way, as their fire can be directly controlled by the leader of the bombing squad.

When the operation consists of a raid into enemy's trenches, to return when the object is accomplished, arrangements for bringing back wounded should be made. If it is intended to gain ground and hold it, preparations for consolidating the position must be made beforehand, troops must be detailed to hold definite sections of it, and the necessary tools and sandbags must be taken up by them. Arrangements must also be made for establishing grenade stores in the captured trenches.

The various accessories required, such as periscopes, flags, or flares to signal progress, electric torches for dugouts, etc., must be provided.

The supply of grenades is dealt with in Section 18.

4. The method of attack by a small bombing squad working down a trench has already been described (Sec. 9).

For operations on a larger scale along a line of trenches in which we have already established ourselves, or to drive the enemy out of a large section of our trenches which he has captured, the attacking party should be organized into point, support, side parties (for dealing with side trenches), main body.

The composition of these parties will vary according to circumstances. Their duties are as follows:

The point is the party which makes the actual attack. It will usually consist of one complete bombing squad, organized as in Section 4. The attack is carried out in a series of rushes from one traverse to another, the bayonet men leading. Immediately before each rush the throwers throw grenades into the trench to clear it for as great a distance as possible. Wherever there is room the throwers, whether two or three in number, should throw simultaneously and divide the distance between them. One should be responsible for the short throws, and one (the

best thrower) should always throw as far as he can. The advance can also be supported by the rifle bombers using the Mills rifle grenade. Everything depends on the accuracy of the throwing; grenades which burst outside the trench are wasted. The attack must be pushed home with vigor, and must never be allowed to degenerate into a grenade duel. The enemy should be kept on the run and allowed no time to make a stand.

The carriers are responsible for the immediate supply of grenades to the throwers. Behind the carriers should come the officer directing the attack. He should have a periscope for observation purposes. He exercises a general control over the throwing discipline and regulates the rate of the advance. He also arranges the relief of the men of the point from the support. Men so relieved join the main body, not the support.

The duties of the support (a complete squad from the same company as the point) are to supply the reliefs for, or replace casualties in the point, and to clear dugouts. They should also be prepared to get out of the trench and work round the flanks, taking what cover they can find in shell holes, etc., when the point is held up by a hostile block or for any other cause. This method of clearing a trench is frequently most effective. The thrower can see what he is doing, and gets a much longer and more accurate throw when throwing from the open than when throwing from the trench. The movement of these flank throwers is dependent on our own machine guns or Lewis guns and snipers being able to keep down those of the enemy.

For clearing dugouts, two Pippin grenades should be thrown into them. This will usually have the effect of driving the survivors of the enemy up into the open. If no Pippin grenades are available after two grenades have been thrown into the dugout, two bayonet men should go down with an electric torch. They should be on the lookout for the enemy hiding in underground passages off the entrance to the dugout.

The support also hold any side trench until the arrival of the side party detailed for that trench.

The support is reenforced from the main body, not from the side parties, which are immediately in rear of it.

Side parties form distinctive units and will not be used for reenforcing. The parties will be numbered and every man should

know the number of his party. Each party usually consists of one squad. The number of parties detailed will depend on the number of side trenches to be blocked, but only two parties should move in front of the main body. Each side party should understand whether it is to picquet the trench or to block it permanently, in which latter case a working party with sandbags should join them from the main body.

An officer should be in charge of the side parties and detail each party to its particular trench. He must also look out for any attempt by the enemy to counterattack across the open.

The main body is responsible for keeping the support up to its full strength, and will garrison and consolidate all ground won. It is also responsible for organizing a chain of supply from the advanced grenade depot to the forward parties.

Some Lewis guns will usually accompany the main body. The support of machine guns and Stokes mortars should be arranged if possible.

41—Advance in, and Step by Step Defense of, Communicating Trenches:

Figures 21 and 22 indicate, in a general way, the disposition and movements of the grenadiers in operations of this nature, which are about the same as in cleaning up a fire trench.

The type method of operation is based on the following principle: The enemy must be driven back, step by step, and due precaution must be taken to minimize the losses that may be caused by his grenades. Progress will therefore be attempted under the following conditions (fig. 22):

1. Organize a forward group composed of—

(*a*) A rifleman (*f*) who acts as a point, stops the enemy grenadiers, and protects our own. Reserve rifleman at (*f*).

(*b*) Two grenadiers (1, 1) who methodically throw grenades to points 1, 2, and 3, then to points 1′, 2′, and 3′, always beyond the defilated spaces, so as to insure a constant and progressive cleaning out.

(*c*) A chief of group (Ch) who directs the combat, corrects the fire, organizes the relief of the grenadiers and of the carriers, superintends the ammunition supply, and holds himself

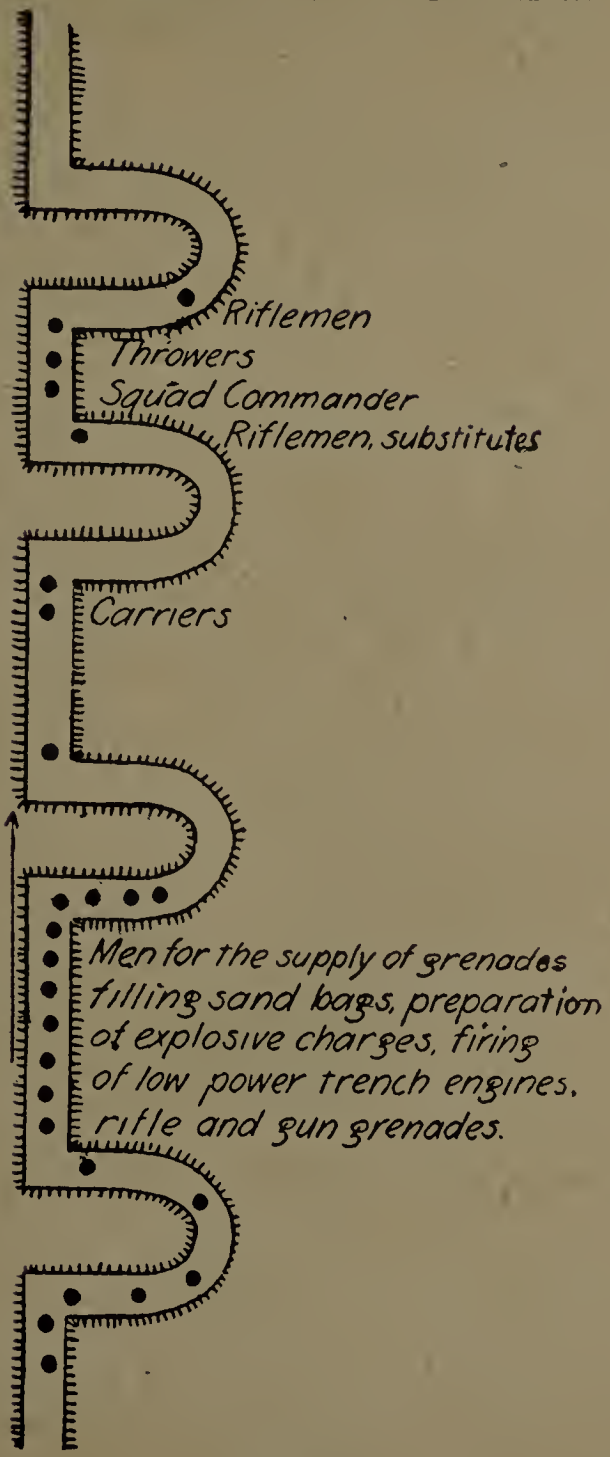

Riflemen
Throwers
Squad Commander
Riflemen, substitutes
Carriers
Men for the supply of grenades
filling sand bags, preparation
of explosive charges, firing
of low power trench engines,
rifle and gun grenades.

Fig. 21

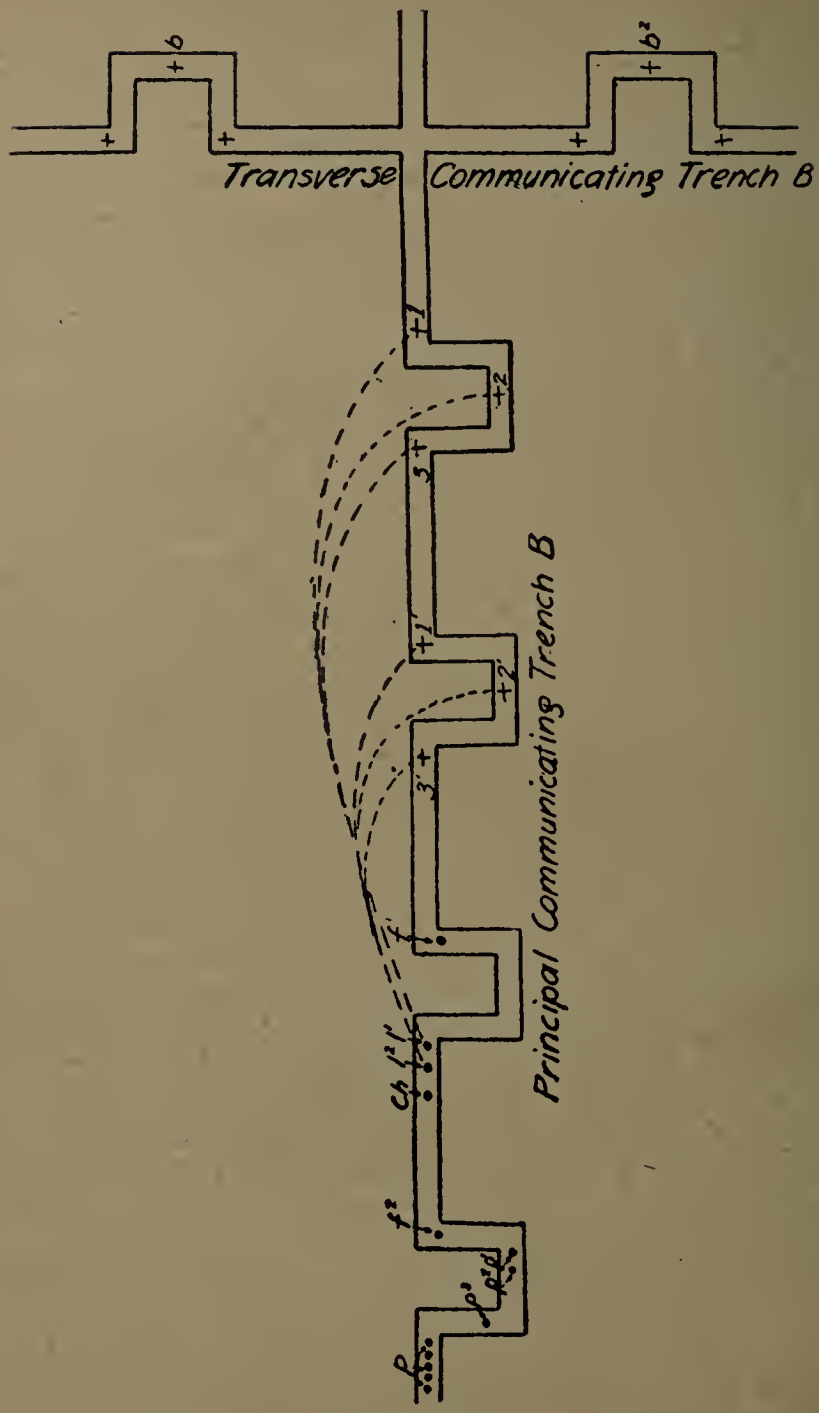

Transverse Communicating Trench B
Principal Communicating Trench B

Fig. 22

ready to defend his ground, foot by foot, if further progress becomes impossible.

2. Organize an ammunition replenishment chain composed of—

(*a*) Three ammunition bearers, or carriers (*p, p, p*), placed somewhat apart so as to have freedom of movement. They pass up grenades in baskets, haversacks, or bags.

(*b*) A series of relays, proportional in number to the constantly increasing distance which separates the combatant group from the principal grenade depot.

3. Organize a group of pioneers (*P*) close to the advance group of carriers, which should always be ready to construct a barricade or to demolish those of the enemy. The pioneers should be supplied with shovels, picks, empty sandbags, bombs loaded or ready to be loaded with explosive charges. They may also have rifle grenades to hinder the enemy's supply system, and one or two automatic riflemen to defend their barricades.

All men are required to preserve the most profound silence and to observe attentively all sounds coming from the enemy.

The grenadiers, supplied without interruption by the carriers, throw grenades continuously, one thrower upon the nearest enemy and another as far forward as possible, so as to prevent the enemy from bringing up grenades. Hostile barricades are destroyed as far as possible by charges of explosives.

When the leading squad judges that the enemy is overcome (as shown by slackening or cessation of his grenade fire, indications given by noises, etc.) the riflemen slide forward in the smoke, glance around the corner, and signal to their comrades; and so the forward movement continues from turn to turn or from traverse to traverse.

When a rifleman sees a lateral communicating trench (B^1), he signals to the throwers, who place a series of three grenades in each direction (at b^1 and b^2). The trench is at once explored so as to avoid surprises. If no movement is to be made in this new direction, a barricade is established at some distance from the principal communicating trench, so as to place it out of range of hostile grenades. This barricade should be built of sandbags and guarded.

A detachment is specially charged with filling sand bags, so as to permit the rapid building of barricades.

It is well to use gun grenades, or mortars of low power to interrupt at long range the enemy's supply of hand grenades.

If the advance is temporarily checked, the ground already gained must be defended foot by foot until the advance can be

Fig. 23

resumed. In this case impede the enemy's advance by increasing the number of barricades, obstructing the trench by piling up sandbags or by breaking down the sides of the trench, so as to force the enemy to expose himself to rifle fire. (Fig. 23.)

It may be possible and advisable to draw the enemy on to a point where he will be outnumbered in grenadiers and where he may be decisively defeated. (Fig. 24.)

42—Assault of a Trench, Prepared by the Grenade:

The assault of a trench is, in general, a combined action which is executed under the protection of powerful bursts of Artillery

fire. But sometimes during the combat the lines are so close together in certain sections that the Artillery preparation can not be made. An effort will then be made to overcome the enemy by grenades so as to fall on him thereafter with the bayonet. A few riflemen, armed with grenades (expert grenadiers if possible), approach the enemy, utilizing all the accidents of the ground. Meanwhile the rest of the group wait behind cover for the moment to assault. The grenadiers overwhelm the enemy with a hail of well-directed grenades, and oblige him either to

Fig. 11.

Fig. 24

evacuate the position or to take to the shelters. At this moment the assault should be made.

The assault is sure to be followed by a struggle in the interior of the hostile position, which can be prepared for beforehand, thanks to our information of the hostile defensive organization.

Well-defined missions may then be assigned to certain squads of grenadiers, such as advancing through the communicating trenches toward the intermediary position or the second position; cleaning up the trenches and communicating trenches, etc.

The groups to which these various missions are assigned are specially trained for the purpose in advance.

43—Cleaning up a Trench:

The cleaning up of the trenches comprises two distinct parts, which must be assigned to different squads:

First. The cleaning up, properly so called, which consists in assuring the fact that no enemy remains in the captured trenches or shelters.

The organization of "clearing" or "mopping-up" parties requires very careful prearrangement. The strength of these parties and their position in the assaulting column must depend on the circumstances. Their strength has amounted in some cases to 25 or 30 per cent. of the assaulting force.

If the first waves of the assault are to push forward over a line or lines of hostile trenches to some further objective, they must be accompanied by small parties of bombers, whom they will drop in these lines to prevent the enemy from issuing from his dugouts and shelters, till the arrival of the larger parties farther back in the assaulting column, who are detailed for the systematic clearing up of the line.

The most effective weapon for clearing dugouts is the suffocating grenade, which drives out or suffocates the occupants, and has sometimes set fire to the woodwork. The ordinary explosive grenade is comparatively ineffective against a large dugout with several rooms and passages.

German dugouts have usually more than one entrance, and when clearing up dugouts a sentry should invariably be posted at all entrances to each dugout. One of his duties is to see that the dugout is not bombed by another party while our men are in it.

In wood and village fighting, care should be taken that each dugout is discovered and dealt with. It may also be necessary in some cases to drop parties to clear up the shell holes in front of and behind a line of hostile trenches or to search a field of long grass or crops for concealed machine guns.

The importance of such clearing-up operations is very great, and neglect to provide for them has had most unfortunate results on more than one occasion. Special precautions are neces-

sary to insure that men detailed for such work do not push on with the advancing line.

The squads charged with the cleaning up of the trenches, properly so called, follow a fixed itinerary. They run along the trenches and the communicating trenches and do their work so that *no part of the trenches is overlooked.* They strew grenades along their passage, their attention being especially directed to the shelters, whose openings, often concealed or closed by the bombardment, are not always apparent. The prisoners are collected and rapidly sent back by the noncommissioned officers in command of the cleaning-up squads.

Second. The destruction of hostile detachments which continue to resist in certain places.

The squads intended to overcome any possible resistance are composed of expert grenadiers. They march with the second line, and, always on the alert, they rush upon the points where the enemy still resists, following the trenches, as far as possible, so as to attack from the side least defended.

44—General:

The grenade is continually employed in the execution of sudden enterprises (coups de main) or sorties, which are attempted by small groups of chosen men, having mutual confidence in each other, and especially trained in grenade work; or by a unit, likewise selected and sometimes given a stronger proportion of noncommissioned officers, and which leaves uncertain members behind.

Sorties have for their object the throwing of grenades into an occupied portion of the enemy's trench, the attack of a sap head, the occupation of a crater, the capture of a listening post or trench, or to bring back prisoners.

The success of such an operation depends essentially upon the care with which it has been prepared by minute reconnaissance and by the thorough rehearsal of all phases of its execution under conditions as near as possible to those actually existing.

45—Preparation:

The preparation must be made with the most minute care.

The special rôle of the officer who is to carry out the enterprise is:

First. To see to all the necessary reconnaissances (terrain, accessory defenses, hostile trenches, etc.).

The terrain must be studied from the double point of view of avenues of approach and of shelter which will permit lodgment for the grenadiers within grenade range of the enemy's position.

The defensive arrangements of the enemy can be advantageously studied on photographs taken from the avions.

Second. To study the conditions under which the operation will be carried out (weather, hour, etc.).

Third. To assign to each squad a well-defined task.

Fourth. To arrange the best system of supply.

Fifth. To put the infantry and artillery who are to support the operation in touch with the manner in which he proposes to carry out his mission.

The officer in charge of the sortie personally conducts the squad charged with the principal operation. He should hold one of his subordinates responsible for the supply of grenades.

After the preparation for the sortie, made on the spot in the trench, in front of the hostile position, the troops charged with its execution should be taken to the rear for some time so as to prepare themselves by rehearsal of the appropriate exercises.

46—Attack of a Trench by a Sortie:

The group which is to carry out the attack approaches the enemy's trench silently; if there has been artillery preparation the approach must be very rapid.

When the group is close to the points chosen for crossing the accessory defenses (supposed to be destroyed in front of the point of attack), a shower of grenades is thrown into the enemy's trench. Immediately after the burst of grenades the men leap into the trench.

Such an operation usually requires two groups, who, once in the trench, proceed to the cleaning up thereof, one to the right and the other to the left.

All precautions should be taken to avoid the enemy's grenades. A position prepared a few yards in rear of the first line may have been arranged by the enemy, and this must be taken into consideration.

Sometimes it is well to choose a very dark night or very bad weather. An understanding must then be arranged between the garrison of the line of departure and the group of grenadiers. For instance, a few shots fired in a certain manner warn the grenadiers that a light rocket is going up. The grenadiers lie on the ground and profit by the light to study their terrain. As soon as the rocket goes out they rush forward.

During the cleaning up the riflemen keep watch on any special objectives, according to orders given them before the departure.

Notes.—It must be realized by all ranks that the rifle and the bayonet is the main infantry weapon. Grenades are useful for clearing small lengths of trench and for close fighting after a trench has been rushed; but no great or rapid progress will ever be made by bombing; and an assault across the open after adequate preparation will usually be a quicker and, in the long run, a less costly operation than bombing attacks on a large scale.

There is a tendency in bombing operations for more grenades than necessary to be thrown, thus tiring out the throwers prematurely and wasting grenades. This is due partly to neglect of throwing discipline, and also in some cases to the bombers having been overloaded with grenades and hastening to get rid of part of their load; 120 grenades per bombing squad of 8 men is as large a quantity as can be carried. Reserve supplies for immediate use can be formed, when the objective has been reached, by collecting the two grenades per man, which should be carried by all infantry.

PART 2.

47—Capture of a Blockhouse or of a Machine-Gun Position:

For this drill, works of the type represented by figure 25 should be constructed. While one or two crack shots or a machine gun occupy the attention of the enemy machine guns or blockhouse, by holding the embrasures continually under fire, the rest of the group makes a rush to the side, taking advantage of all the accidents of terrain, especially of shell craters, and approaches the flank and the rear of the enemy till within grenade range. They then overwhelm the embrasures and the

entrance to the blockhouse with grenades, until the enemy is put out of action and they can take the works.

Paragraphs 29 and 32 must not be understood as laying down an obligatory mode of instruction. They are only intended as a

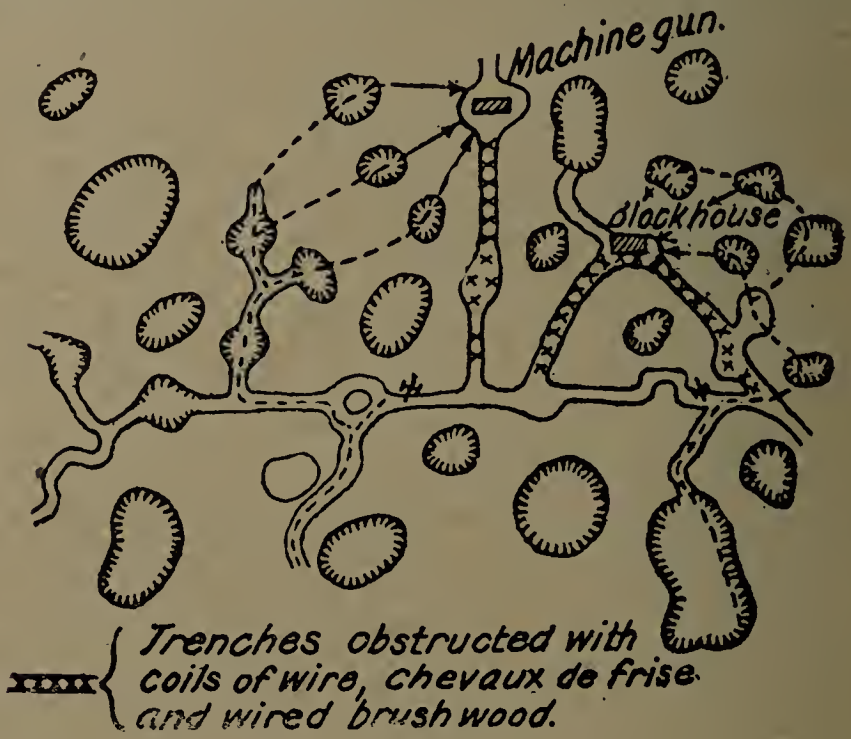


Fig. 25

model to draw from in conducting the instruction. Only the general outline of the attack and the end in view need be uniform.

48—Destruction of Obstacles:

In case of necessity, when there are no other explosives or inflammable materials at hand, grenades may be used for the destruction of obstacles. They are in no way suitable, however, for loading a mine chamber.

A long charge (Gestruckte Ladung) serves to cut a breach through a wire entanglement. Take a rod or pole whose length corresponds with the depth of the wire entanglements; attach the grenades to it so as to leave an interval between them of

about 15 centimeters (5.9 inches). The mouths of the grenades should all be headed in the same direction. To transmit the explosion from one grenade to another, place in each mouth a detonator held in place by means of a little wooden wedge. Two men creep up with the long charge and slide it under the wire entanglements or throw it on the latter. The charge is prepared for lighting by fastening into the last grenade a handle with a detonator (see fig. 26). A man placed in a sheltered position fires the detonator by means of a string of sufficient length.

Fig. 26

A concentrated charge is prepared by attaching six or a larger number of grenade bodies to a grenade. It is not necessary in this case to attach a detonator to each grenade body (see fig. 27). A man creeps to the edge of the wire entanglements to be

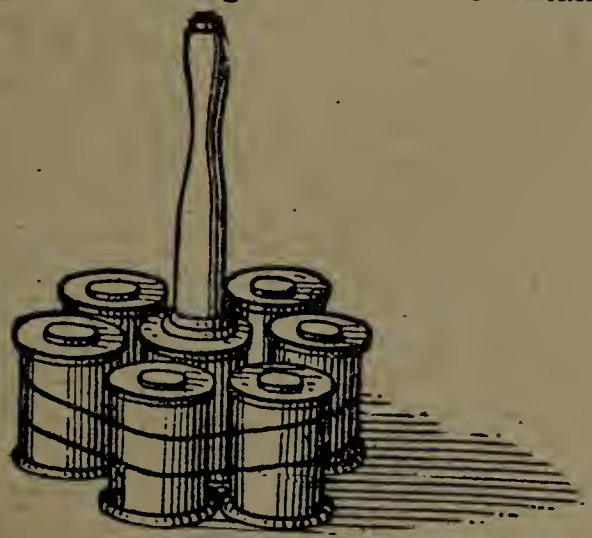


Fig. 27

destroyed. He prepares the charge for lighting (by fastening the handle to a detonator), removes the igniter and throws the charge into the center of the obstacle.

To destroy an obstacle in the shape of a metallic grating, prepare a small, long charge, which is attached about half way up the obstacle, and then exploded by pulling out the igniter. If this type of operation can not be adopted, throw grenades furnished with hooks. Obstacles of metal grating and of abatis of branches can also be destroyed by throwing a concentrated charge directly at or under the obstacle.

PART 3.

49—Employment of Bombers in an Attack on a Large Scale Across the Open:

The chief duties of bombers in an attack on a large scale will be to clear trenches over which the assaulting troops have passed, to protect the flanks of the attack when it has reached and occupied the enemy trenches, to secure the enemy communication trenches, and to form barricades so far down them that grenades can not be thrown into the main trenches just captured.

Attacks often succeed at some points and not at others, with the result that our own and the enemy's infantry are in the same trench. Bombers are invaluable in such cases.

Bombers may also be of great use in street or wood fighting and for patrol work at night. The strong points and underground defenses in villages, as well as posts and barricades in the streets, call for the special use of grenades. The combination of hand and rifle grenades, smoke bombs, machine guns, and light mortars is of the first importance in village fighting. The consolidation of captured woods has often proved a very difficult operation owing to strong enemy detachments having been able to conceal themselves during the advances of our infantry, and subsequently to develop machine-gun and rifle fire behind and on the flanks of the captured line. Strong clearing parties, largely composed of bombers, must therefore be detailed to deal with organized opposition after the assaulting troops have passed on.

Rifle grenades, particularly the Mills, are often of great value for dealing with hostile machine guns or strong points which check the attack.

Bombing squads and parties should therefore be detailed for the following duties:

(*a*) To clear trenches and areas over which the assaulting troops have passed.

(*b*) A party to deal with each communication trench leading toward the enemy from the line which forms the final objective of the attack.

(*c*) Parties on either flank of each body to block trenches on the flanks or extend the ground won laterally.

Of the above the most important duty is that in (*a*). Experience of recent attacks has shown that it is essential to detail strong clearing parties in order to prevent the issue of the enemy from dugouts or other shelter in rear of the assaulting troops.

Plans for the actions of bombing squads should be carefully thought out beforehand and should be based on a study both of the ground and of the air maps of the enemy trenches. Each bombing squad should be made to understand very clearly the main objective of the attack as well as its own immediate objective, and also how far beyond or to the flanks of such objective it is to proceed. When possible, orders should be given in advance with regard to the fire and communication trenches which are to be stopped and the points at which this is to be done.

The position of bombing parties in an attack must depend on the tasks to which they are allotted. The parties detailed to clear the first trenches in rear of the assaulting troops should follow close in rear of the leading line of infantry, while parties to clear trenches farther forward should follow in rear of the second or succeeding lines. Parties to deal with communication trenches when the final objective is reached are probably better placed with the first line, as if they follow in rear it will be harder to control them and direct them on the required point.

In addition to the special parties detailed, the bombing squads of companies in the front line should be on the flanks of their companies. They are then at once available to work outward should the attack succeed at one point and fail at others.

CHAPTER IV.

SUPPLY OF GRENADES

PART 1.

50—Method of Supply:

The supply of grenades must be the constant care of the commanders of all groups. The most minute precautions must be taken to prevent the grenadiers running short of grenades, and arrangements should be made to start *two* grenades forward for every *one* that is expected to reach its destination.

The supply comprises, both on defensive and offensive:

1. The carrying by all the men of a certain number of grenades. The expert grenadiers and the men forming part of the squads designated to fight with grenades receive a more plentiful supply, carried in special haversacks.

2. The building of well-sheltered depots, whose position should be known to all grenadiers. It is well not to have too many of these depots.

3. Organization for transporting the grenades from the depots to the combatants.

On the defensive, the first condition for assuring the supply is that the depots should be near the combat posts of the grenadiers and placed in good shelters.

The personnel charged with the supply must know perfectly the places of the combat posts and of the different depots; this personnel should be placed under the orders of a noncommissioned officer specially detailed for this work.

On the offensive the supply detachment must not only consider the grenades needed by the combatants, but also the establishment of advance depots, built as the advance progresses.

As a rule depots will be established as follows: Near the communicating trenches which are to be built to connect the departure trench with that of the enemy when taken, in the

forward part of the communicating trenches of the enemy, and near the flanks of the objective attacked.

The grenades must be sent forward in sacks or baskets, ready for use.

51—Summary of Instructions Issued by a Brigade for the Supply of Grenades in a General Attack:

NOTE.—These instructions, which were issued for the attack on July 1, 1916, are only to be taken as a general guide on the points on which instructions should be issued.

Equipment.—The following number of grenades will be carried by the personnel of bombing squads:

	Mills	Rifle grenades	bombs Smoke
Noncommissioned officers.....	6	4	2
2 bayonet men	12	.....	4
2 throwers	24	.....	4
2 carriers (reserve throwers).....	24	.....	4
2 rifle bombers	8	20	.....
	74	24	14

These grenades will be dumped near the billets to be occupied by the brigade prior to the commencement of operations. When once they have been distributed they become part of the men's equipment. The man himself should see that his grenades are ready for immediate use and all safety pins easy of removal.

In addition to the above, every Infantry soldier will receive two Mills grenades. The requisite number of grenades will be issued to battalions previous to operations and will become part of their equipment. The grenades should be carried in the lower pockets of the jacket and be carefully inspected by the platoon officer concerned.

Grenade stores.—The following grenade stores will be established:

	Mills
1. Right battalion, at.....	1,000
2. Center battalion, at.....	2,000
3. Left battalion, at.....	1,000
4. Left battalion, at.....	2,000
5. Advanced brigade store (reserve store), at.....	10,000
	16,000

In addition there will be a reserve of 2,000 grenades (1,000 short and 1,000 long) and 1,000 smoke bombs distributed between the above stores.

The main supply of grenades to the brigade during operations will be maintained by the divisional store at——.

Total number of grenades with the brigade at commencement of operations:

	Mills	Rifle grenades	Smoke bombs
(*a*) With bombing squads.....	4,736	1,536	896
(*b*) 2 per man.....	5,600	.....	.....
(*c*) Stores	16,000	2,000	1,000
	26,336	3,536	1,896

Battalion bombing officers will be responsible for the establishment of advanced battalion stores in the captured trenches as early as possible.

Carriers.—Officers commanding companies will be responsible for organizing the flow of grenades from the advanced store to forward parties; the battalion bombing officer will be responsible for the establishment of the advanced store in the captured trenches, for informing officers commanding companies of the position of the advanced store, and for the supply of grenades from the battalion store to the advanced store. The approximate position of the advanced store should be decided beforehand.

The brigade bombing officer is responsible for the flow of grenades from the brigade store to the battalion store and for the fusing of all grenades before they leave the brigade store.

To give effect to this system—

In each platoon five men will be told of, in addition to the company bombers, to act as carriers if required. They will wear a special distinguishing mark.

From each battalion store the battalion bombing officer and a party will work forward to establish an advanced store, a non-commissioned officer from the brigade will be at each battalion store to supervise the maintenance of supply from the brigade store.

At the brigade store will be the brigade bombing officer and his party, fusing and carrying forward to battalion stores.

The brigade will be represented by two men in the divisional store.

Method of carrying.—One hundred spare bags will be kept in each battalion store and 200 in the advanced brigade store. One thousand grenades in each store will be ready in bags. It will be left to the discretion of the noncommissioned officer or officer in charge whether grenades are sent forward in bags or boxes.

Indents.—All indents for grenades to brigade advanced store must bear the following details:

(*a*) Unit.

(*b* Type and number required.

(*c*) Destination.

(*d*) Urgency or whether merely to complete establishment.

Supplies to battalions will, in every case be dealt with first.

Fused grenades.—All grenades in stores previous to the operations will be fused, and the safety pins of No. 5 Mills bombs will be carefully inspected.

Mobile reserve.—The battalion mobile reserve wagons will be brigaded during operations and will be prepared, if necessary, to dump the grenades at the brigade advanced store, and afterwards to ply between the divisional store and the brigade store. The latter in the event of the tram being destroyed.

Battalion bombing officers will see that the grenades in the wagons are carefully inspected beforehand. These grenades will not be fused.

The route from divisional store to brigade advanced store should be reconnoitered.

PART 2.

52—Supply of Grenades in Attack:

The supply of grenades is perhaps the most important point in the organization of a grenade attack. Unless a constant and steady supply of grenades can be kept up, the attack will fail.

SUPPLY DURING A BOMBING ATTACK.

In the case of a grenade attack from a line of trenches in which

we are already established, the principles on which this supply must be based are:

(*a*) Establishment of grenade depots, which must be kept filled. There should be one close to the spot from which the attack starts, one at battalion headquarters, and one near brigade headquarers to feed the latter.

(*b*) Preparation of each grenade by inserting the detonator ready for use before it leaves brigade headquarters and by examining safety pins to see that they can easily be withdrawn.

(*c*) An initial supply carried by the men taking part in the attack. Every man should carry a supply of grenades.

(*d*) Certain and rapid transit of grenades from the depots to their destination in order to maintain the initial supply. The most satisfactory method is to have a chain of men at intervals from the advanced depot to the front of the attacking party, passing supplies up from one to another. Attempts to keep up the supply by sending men backward and forward along the trench for fresh supplies usually breaks down, owing to the trench becoming blocked or to the carrying parties being waylaid or lost.

The number of men required to form a chain at suitable intervals from the advanced depot to the final objective requires careful calculation.

The chain method may fail or prove costly in personnel if a hostile artillery barrage is formed.

Another method is to have a definite unit, e. g., a company, specially detailed to carry forward grenades. A unit so detailed should employ whatever method is best suited to the tactical situation, but must begin its work of bringing up supplies of grenades immediately the attack is launched.

(*e*) A recognized chain of responsibility for supply. Os. C. companies should be responsible for organizing the flow of bombs from advanced depots to forward parties, the battalion bombing officer from the battalion depot to the advanced depots, and the brigade bombing officer from the brigade to battalion depot. The brigade depot is replenished from the divisional ammunition column.

The types of grenade carriers in use are described in Chapter I.

53—Supply During a General Attack:

In the case of a general attack the same principles should be observed as far as possible, advanced depots being established in the captured trenches as early as possible, and arrangements made to insure a continual supply to meet requirements. Carrying parties must be detailed to take forward grenades, and the initial supply with the assaulting lines should be as large as possible. With this object each man in the assaulting lines should carry two or three grenades. It is very necessary to insure by good discipline that these grenades are not wasted by indiscriminate throwing.

Prior to the delivery of the attack depots of grenades should be established along the whole front system of trenches, and particularly along the communication trenches, in which a number of grenade stores should be prepared and be clearly marked and their position made known to all ranks. The farther grenades have to be carried during an attack the smaller will be the numbers which actually reach the leading troops. Moreover, communication with the rear may be cut off by hostile artillery fire.

The following initial distribution is suggested:

(*a*) To squads detailed for bombing as many grenades as can conveniently be carried. (Note.—It is a mistake to overload bombers and only leads to waste of grenades, as men will hasten to get rid of part of their load.)

(*b*) Two Mills grenades to all other infantry soldiers in the battalions detailed to open the attack. It will frequently be advisable to collect these on reaching the objective in order to form a reserve for the bombing squads.

(*c*) Battalion depots in the front system trenches.

(*d*) A brigade depot farther in rear from which the battalion depots are replenished.

Adequate bomb-proof cover must be provided for these depots.

There should be a reserve of carriers (buckets or bags) at all depots.

All bodies of men sent forward in support of the attack should carry grenades. The issue of these grenades should be made from the rearmost depots if possible, so as not to deplete those farther forward; arrangements for replenishing the depots must be worked out beforehand.

In the enemy's trenches supplies of his grenades are usually to be found. Bombers should therefore know how to use them. Details of the construction of German grenades are given later on in this manual.

The following are most important points in the supply of grenades in a general attack:

(*a*) Every officer and noncommissioned officer must know the position of main grenade stores.

(*b*) Forward depots in the captured trenches must be established as early as possible. When a position is captured, a supply of grenades should at once be sent for, whether immediately required or not. The approximate position of forward depots should be selected beforehand, and made known to all ranks.

(*c*) The system of carrying must be organized.

(*d*) Waste must be strictly prevented, and grenades collected from casualties when possible.

Grenades serve specially, during an attack, to annihilate or paralyze an adversary stationed in or behind a shelter who can not be reached by firearms, in order to make him cease all resistance.

The equipment of men supplied with grenades differs according to their duty. The following is the usual equipment: A steel helmet is worn; rifle or carbine slung over the shoulder, or pistol; two sandbags filled with grenades and hung around the neck over both shoulders, or special pockets for hand grenades; pioneer tool; gas mask; bag with four days' reserve rations, and two small canteens. Neither haversacks nor cartridge boxes are ordinarily carried (cartridges are carried in the pocket of the jacket or in the pouch).

Generally, each man, as well as the commander of the detachment, receives from six to eight handle grenades, or a slightly larger number of ovoid grenades. The men and groups having special duties to perform at certain points of tactical importance in close combat may receive a larger supply of grenades.

If, during an attack, the assailants silence the fire of the enemy's trenches, and if they find themselves within throwing range, all the men, while they are running, should cover the enemy's trenches with grenades, then lie prone to await the

explosion, and then jump into the trenches without allowing anything to hinder them. If they encounter an incompletely destroyed obstacle at this time, it should be destroyed by means of a prolonged hail of hand grenades. In an attack against isolated enemy positions—for example, against flanking positions, or during the progressive occupation of enemy trenches—only a few men are generally used for throwing, while the rest pass them the hand grenades and guard them.

Grenade attacks executed as independent enterprises (offensive reconnaissance, occupation of craters, capture of isolated trench elements, of blockhouses, small woods, and farms) generally require, beside minute preparation, the support of other forces (machine guns, trench mortars, and artillery).

It is necessary to take special measures for the replenishment of grenades.

PART 3.

54—Allowances of Grenades:

	Infantry headquarters company.	Infantry rifle company.	Engineer company.	Training company of a training battalion.	Division schools.	Infantry school of arms.
Hand grenades:						
Live offensive	200	200	200	200	‡400	‡200
Live defensive	200	200	200	200	‡400	‡200
Practice, armed with fuze and caps only	200	200	200	200	‡400	‡200
Recharging material for practice grenades	4000	4000	4000	4000	‡8000	‡4000
Dummy	100	100	100	100	‡100	‡200
Chemical lethal	10	10	10	10	‡40	‡50
Chemical incendiary	10	10	10	10	‡40	‡50
Smoke	50	50	50	50	‡200	‡200
Rifle grenades:						
Live	250	250	250	250	‡400	250
Dummy	*200	*200	*200	*200	*300	9200
Message carrying	40	10	10	10	‡50	‡50
Grenade holder V. B. for rifle	*30	*30	*30	*30	(†)	*200

* Total allowance; to be replaced as needed.
† To be obtained from organizations in the division when needed.
‡ Monthly allowance.

CHAPTER V.

THROWING GRENADES

PART 1.

55—Mechanical Methods of Throwing Grenades:

Mechanical methods of throwing hand grenades have the advantage of enabling a hostile trench to be made uncomfortable without exposing our own men, and of operating at a greater distance than is possible when throwing by hand. It also permits grenades to be methodically thrown on critical points of the enemy's trenches at intervals throughout the day or night. The mechanical grenade throwers in general use consist of ordinary rifles, special devices, and trench guns or mortars.

56—Rifle Grenades:

The construction and uses of the rifle grenade should be carefully taught in the manner indicated for hand grenades, and with the same painstaking care.

The rifle may be held in the hand, the firer kneeling, the rifle butt on soft ground, a piece of turf, or a bundle of rags. It may be fired from a rack or rest (see figs. 28, 29, 30), which insures greater accuracy and rapidity, and also permits the accurate laying of the rifle from behind shelter by means of a level with a jointed leg or some similar device.

Rifles using grenades may be fired from a rest by a lanyard attached to the trigger, with a small pulley to give direction to the lanyard. From four to six rifles may be fired by the same operator, by the simple device of using the proper number of lanyards and pulleys attached to a crossbar.

57—Precautions:

1. Do not permit the firing of a rifle grenade unless cover is at hand behind which the firer and spectators may seek shelter before the grenade strikes the ground. The stem of the grenade

is sometimes thrown several hundred yards to the rear and would make a dangerous if not fatal wound even at that distance.

2. Do not remove the safety wire until the moment of firing.

The best results are obtained by placing the rifle in a rest or holder. This is especially necessary when it is desired to fire on a critical point of the hostile trenches at intervals throughout the night. A simple rest or frame may be devised on the spot, and it may also be arranged so that one rifleman may fire four to six rifles at the same time.

58—Tactical Employment of Rifle Grenades:

The well-directed employment of rifle grenades demoralizes the enemy and inflicts upon him much more serious losses than the artillery bombardment. As an illustration of this, a battalion of infantry on the western front in Europe is reported to have received a bombardment of 3,000 shells in one day without one man being touched. In the evening, while the men were at supper, laughing about the inefficient work of the hostile artillery, a rifle grenade fell into a group of twelve men, killing four, and wounding eight, two of them fatally.

Enemy trenches should be minutely studied, to find the points where an adversary is likely to be located, such as sentry posts, shelters, crossings of communication trenches, etc. Rifles clamped in racks or rests should be kept laid on these points in order to shoot a grenade at once on any indication of movement at that point. Such a continuous fire, by night and by day, on well-chosen points will cause the enemy appreciable losses, and adversely affect his morale.

Well-directed rifle fire of grenades by small, perfectly trained detachments on an enemy assembling for attack, or upon known and registered points of communication trenches during the hour of changing reliefs, should give excellent results.

In assaults the employment of rifle grenades is closely connected with the action of other units constituting the waves of assault.

In cleaning up communication trenches the fire of rifle grenades should be carefully executed by the supporting groups which follow immediately in rear of the first line of grena-

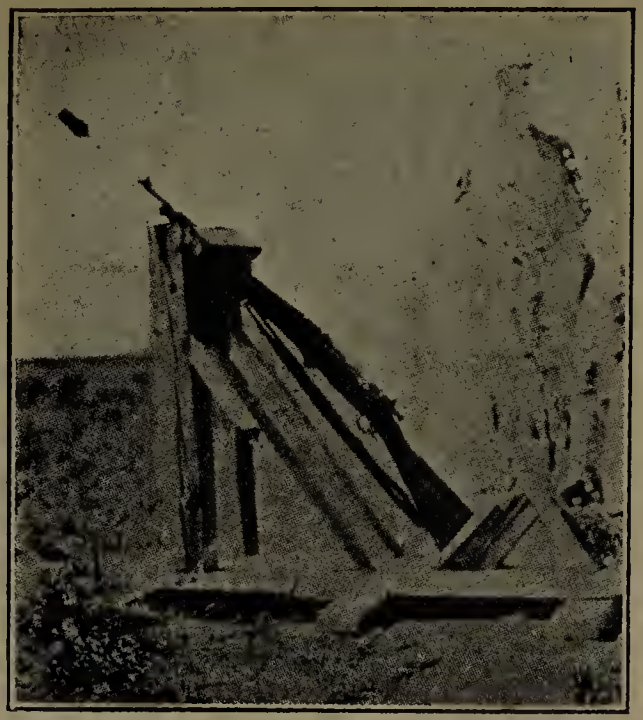


Fig. 28

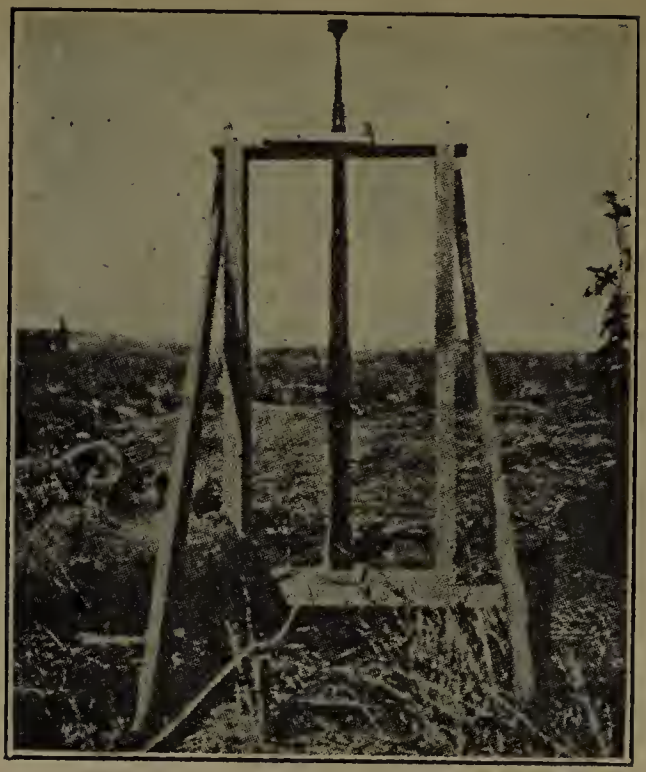


Fig. 29

The above illustrations show two improvised frames for holding a single rifle.

diers, in order to hinder the enemy's supply and to bar his line of retreat.

Grenades fired from infantry rifles at a range of about 200 yards, with an angle of departure of about 45 degrees, give a good angle of fall for reaching the enemy in his trenches.

Fig. 30

This illustration shows a modern rifle rest and grenade thrower combined.

Note.—As a corollary of this method, it is suggested that a table of elevations be constructed for use in high-angle fire of ordinary infantry bullets from rifles and machine guns.

58a—Gun Grenades:

The intelligent employment of gun grenades demoralizes the enemy and inflicts upon him losses much heavier than those due to bombardment.

The hostile trench must be studied minutely in order to know

the points where the enemy may be caught (such as in lookout posts, shelters, the crossings of communicating trenches, etc.). The grenade guns should be kept accurately laid on these vulnerable points, so as to be able to send a grenade upon them at any moment of the day or night.

Notwithstanding the almost complete invisibility of the enemy in his trenches, his small density and his quick disappearance into shelters, it is still possible to cause him considerable losses by sending a ceaseless rain of gun grenades on certain judiciously chosen points.

The chief of a bombardier section has a very important rôle to play. He must be constantly on the watch, his vigilance is perpetual, in order to cooperate to the fullest possible extent in giving the garrison of his sector an aggressive attitude, which should always characterize the periods of calm. Each of his subordinates shares his responsibility in this respect, and this small unit must cultivate and maintain a value in morale which makes it a veritable "corps d'elite."

PART 2.

PROJECTING APPARATUS FOR GRENADES.

59—Organization:

Projecting apparatus or trench weapons are divided into two classes:

(*a*) High-power weapons, used by the artillery bombardiers, and which are described under the head of artillery.

(*b*) Low-power weapons, comprising mortars or bomb throwers whose propelling force is powder, compressed air, or springs. (See figs. 31, 32.)

Low-power weapons are used by the infantry and are organized into batteries of four to six pieces, attached to battalions. The assignment of the weapons of this kind among the different battalions is not uniform, but depends upon the terrain and the specific object to be attained, with a view to concentrating at the most important points the maximum means of this nature.

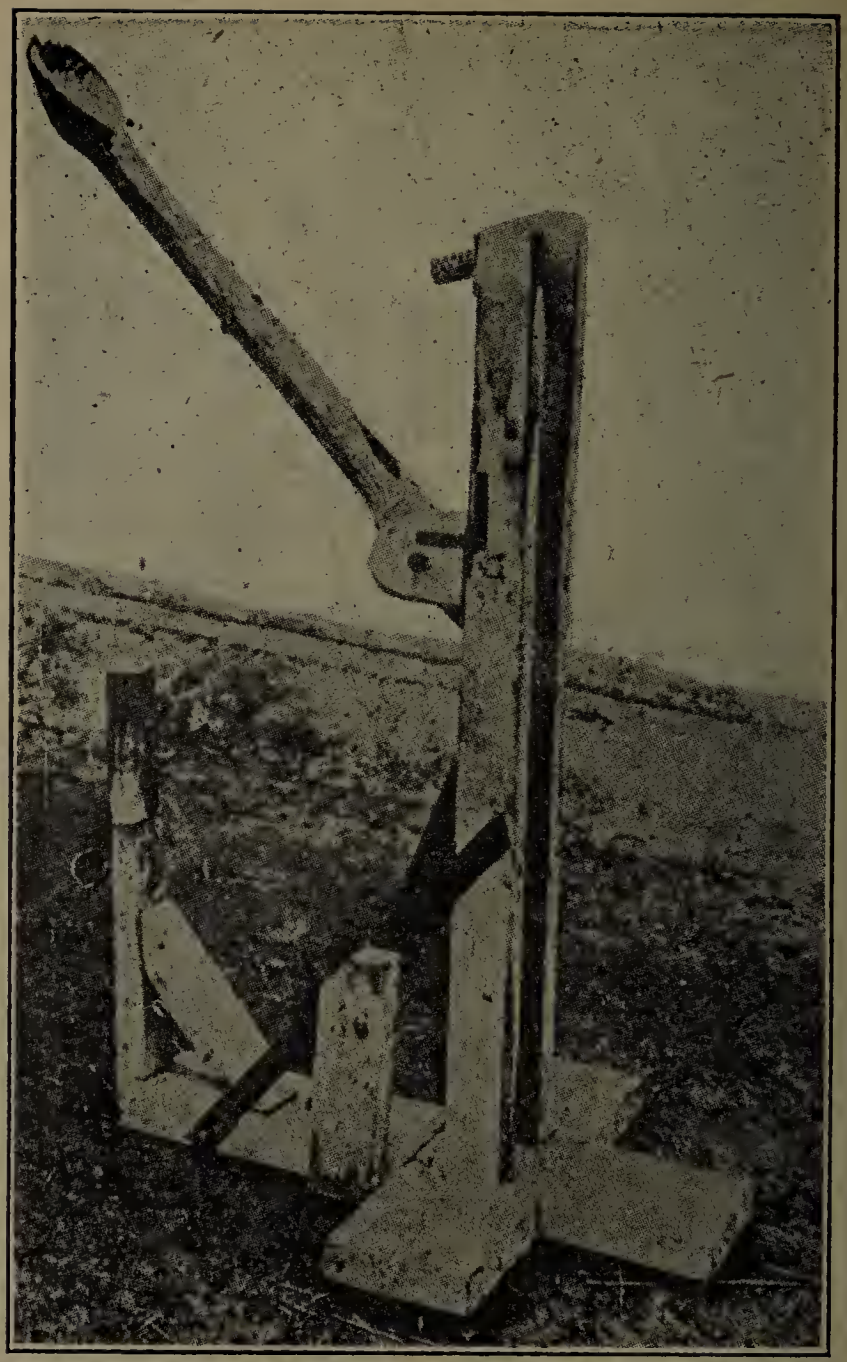


Fig. 31

This device for casting grenades or bombs is of very ancient design, but is being used effectively for dropping bombs on hostile trenches in the European war.

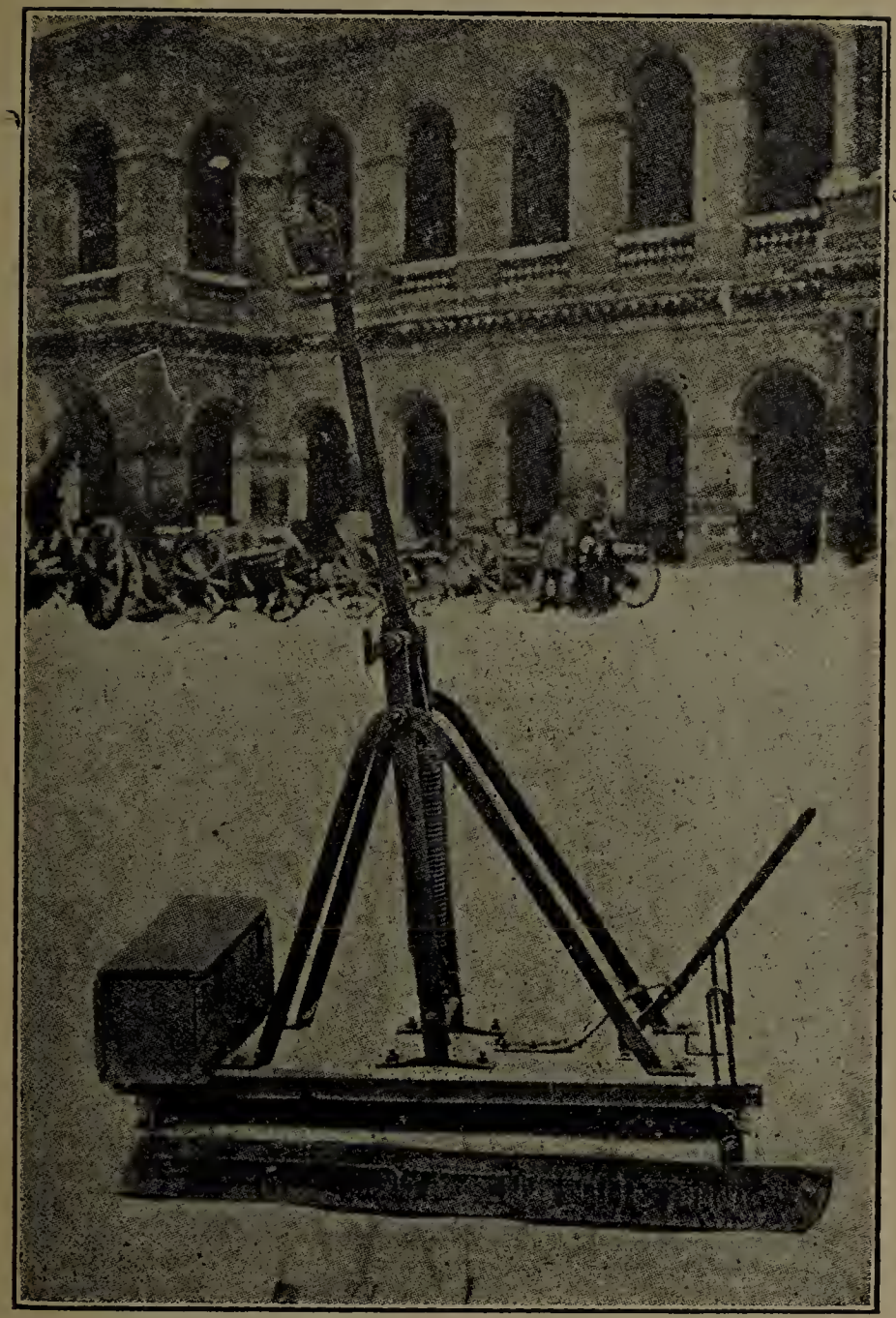


Fig. 32

A modern grenade thrower with its munition case.

60—Tactical Employment:

Low-power weapons have a range, depending upon the propelling charge and the length of the time fuse, from 50 to 350 yards. Their effect is small against material objects, but they are very efficient against personnel behind shelter which protects them from rifle fire.

Their use is particularly valuable in the following cases:

(*a*) *Offensive.*—1. Against enemy works, such as shelters for machine guns, which are demolished or nearly demolished by artillery fire, but in which the enemy has reestablished himself after having withstood the artillery fire in his deep bombproofs.

2. In parts of the front adjacent to those from which our offensive has been started, with a view to cooperate with the infantry remaining on this front, which has now been reduced to a minimum. These weapons can neutralize the action of the corresponding hostile front and can prevent flank movements against our attacking troops.

3. In the defense against counter attack of a newly captured portion of the hostile front. In this case these weapons move forward promptly and organize battery emplacements to assist in the defense or to operate against adjoining portions of the enemy trenches which are too near to be covered by our artillery without danger to our own troops.

(*b*) *Defensive.*—1. To assist in the defense of parts of the front from which most of the infantry garrison has been temporarily withdrawn.

2. To defend parts of the front which are especially close to hostile listening posts, small posts, or advance works which threaten our front line.

3. Near the second or third line in order to render untenable parts of our first line taken by the enemy.

61—Location of Battery Emplacement:

A battery produces its maximum effect when firing obliquely at its target, but observation is easier, and consequently fire is more effective, from the first-line trenches. For this reason batteries intended for destructive and offensive fire are generally

placed in or near the first line. The parts of the line most difficult for the enemy to reach, such as reentrants, defiladed points, etc., are selected, if possible, and three or four emplacements for each battery on successive lines are established beforehand. Each emplacement is divided into two half batteries, separated by a traverse.

62—Employmentof Fire:

Four kinds of fire are distinguished:

1. *Destructive fire.*—To be used against listening posts, small posts in course of construction, and blockhouses and machine-gun shelters already damaged, as, for instance, by artillery fire.

2. *Offensive fire.*—To be added to the fire of high-power weapons in the preparation for attack.

3. *Defensive fire.*—Heavy fire on the parallels of departure of the enemy preparing an attack; heavy fire at critical moments on trenches or communication trenches captured by the enemy. This fire should be violent, unforeseen, and sudden.

4. *Fire in periods of calm.*—Violent fire at any moment when the enemy appears to be negligent, such as when a fatigue party arrives in a trench, during a calm following an attack, during the warm hours of the day, a storm, or on dark, silent nights, etc.

Bomb-throwing weapons use either special projectiles or the ordinary hand grenades (explosive, incendiary, asphyxiating, etc.). They are divided into three classes, according to the propelling force used:

1. Spring apparatus, using the force of unbending springs.
2. Mortars, using the force of gunpowder.
3. Pneumatic guns, using the force of compressed air.

PART 3.

63—Grenade Mortars (Granatenwerfer):

Grenade mortars are used principally to attain an objective which can not be reached by hand grenades. They have a range of 300 meters (328 yards). The dispersion in direction varies from 3 to 5 meters (3.28 to 5.46 yards). The dispersion in range is 50 meters (54.68 yards), at a maximum. For this

reason, grenade mortars should be established, whenever possible, in groups of two to six in a flanking position. The rapidity of fire is six rounds a minute. The chief advantage of the grenade mortar, in comparison with the trench mortar, lies in the fact that the fire is difficult for the enemy to locate.

In the defense, grenade mortars stationed in or, better still, behind the first line, serve to constantly subdue the enemy, to occasion him daily losses, and to hamper him in his works. This result is obtained by firing round by round, uninterruptedly, or by surprise volleys by night or day.

During an enemy attack barrage fire executed by grenade mortars may render it difficult for the enemy to make inroads into our position, or, if he has already penetrated, may oblige him to abandon the position by covering with projectiles the elements of the trench occupied by him. It is necessary to make frequent changes of position.

During our attack the grenade mortars have proved excellent in the preparation of the assault, two or three minutes before the start, particularly when our artillery fire, on account of the close proximity of the opposing position, can not effectively fire on the more advanced trenches of the enemy. During an advance the grenade mortars follow the assaulting columns and are rapidly installed in the captured lines or in the neighboring shell craters. They then fire on the rear of the enemy and help in repulsing counter attacks.

For the organization of the personnel of the grenade mortar service, see the instructions "Grenade Mortar 16," which accompanies each grenade mortar.

64—Rifle Grenade (Gewehrgranate):

The rifle grenade, on account of the small accuracy that characterizes it (wind, etc.), is used more to annoy the enemy than to obtain any radical effect. This is the reason their manufacture has been abandoned. Their action is particularly effective for flanking fire, for covering dead angles and for strong fire on a large surface, etc. The simultaneous entrance of several rifles into action is recommended to prevent the enemy's defiling. It is well to combine rifle grenade fire with infantry fire coming from different points, so as to hamper the enemy in determining the points from which the fire comes.

CHAPTER VI.

PROTECTION

PART 1.

65—Protection Against Grenades:

The method of making a device for protection against the explosion of percussion grenades and gun bombs is indicated in figures 33 and 34. The apparatus is simple and easily constructed whenever needed. The surface of the screen on which the projectile strikes must yield on the shock of impact; hence the use of timber or other rigid material on this surface should be avoided or minimized as much as possible.

Two crosses or "sawbucks" are constructed of wood, with the ends of the crosspieces joined by a stout wire, and a heavy nail or a bolt serving as a pivot. The two crosses are then connected longitudinally with a board, and the corresponding ends of the crosses are joined by a heavy wire. The frame thus constructed is covered with any convenient form of metallic trellis, such as chicken wire.

This grenade screen is placed over the firing or communicating trench, resting on traverses or other points of support, as indicated in figures 35, 36, and 37. It is balanced in position by a sandbag resting on the connecting board. By displacing the center of gravity of the sandbag, the apparatus is easily adjusted to any desired position. Experience has demonstrated the efficiency of this device.

In practice it is found that grenades do not burst as they strike the wire of the screen, but are thrown back by the rebound far enough to be harmless. These screens are used in parts of the trench which are especially exposed to grenade fire. The pivot of the device permits it to be displaced slightly from the normal position, so that lookouts may put their heads out of the trench, and by lifting the apparatus off its supporting points it may be used as an auxiliary defense, especially as an obstacle in a communication trench.

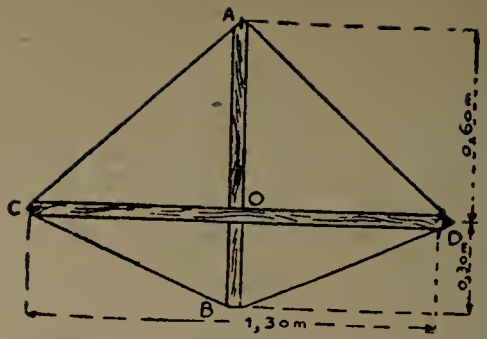


Fig. 33

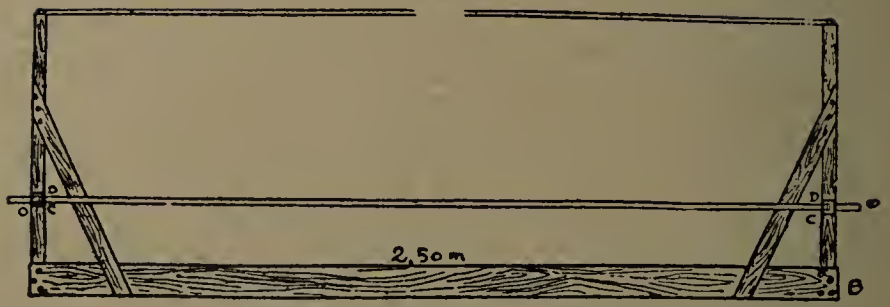


Fig. 34

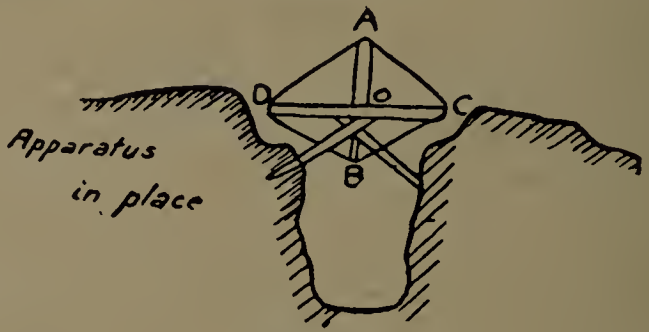


Fig. 35

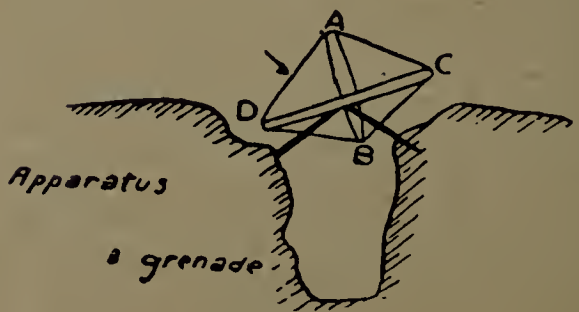


Fig. 36

PART 2.

66—Precautions in Handling Live Grenades:

1. Great precautions are necessary in the handling of live grenades in order that accidents may be prevented. These precautions are especially advisable during the early stages of training in grenade warfare.

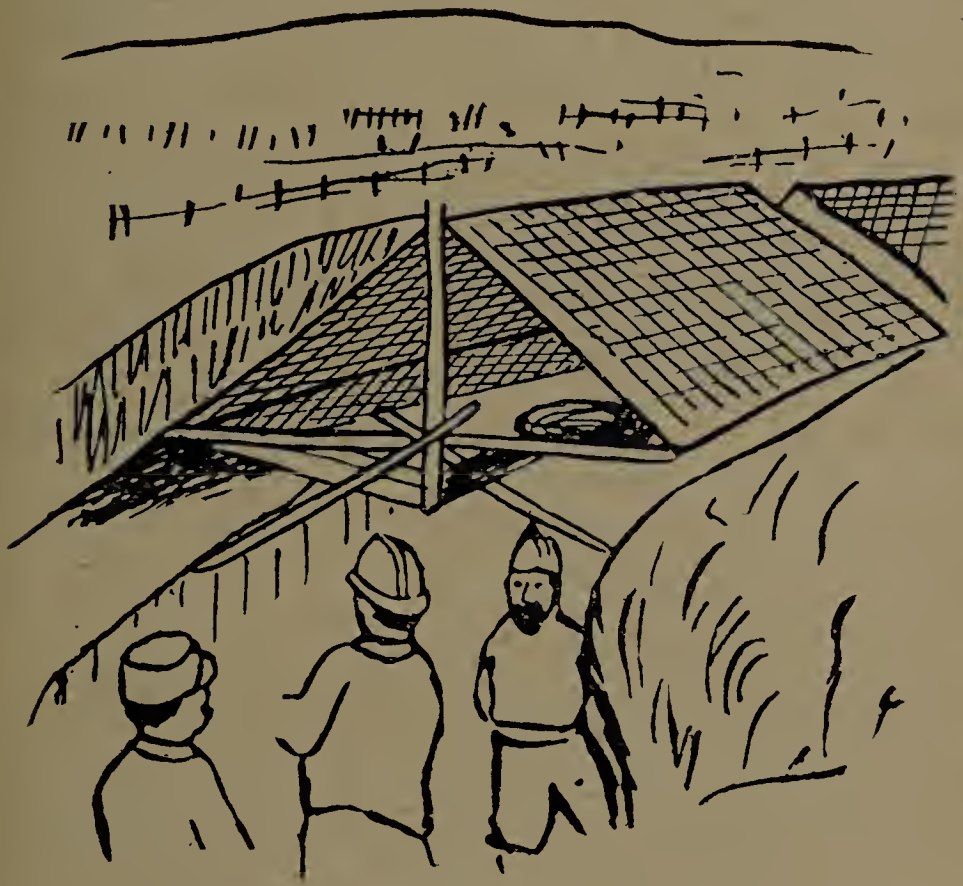


Fig. 37

2. Attention is directed to the caution which appears on page 10, Ordnance Pamphlet No. 1741, 1917, as follows:

Should a rifle grenade fail to detonate on impact after having been fired from a rifle it should be handled with extreme caution, in view of the fact that the safety feature as described above has now been removed. To handle such a grenade it

should be carried with the stem down and if practicable thrown into deep dater, from which its recovery is improbable. If that be not practicable, the grenade should be buried in the ground where it will not likely be recovered.

3. Similar precautions should be taken with other types of grenades.

67—Grenades, Disposal of, after Salvage:

Grenades which, when thrown or fired, have failed to explode are dangerous to handle. If necessary, or if they are likely to be a source of danger to our own troops, they should be destroyed *in situ* in the same way as blind shell, under the superintendence of an Officer.

Grenades returned to Ammunition Railheads after salvage should be inspected by the Inspecting Ordnance Officer.

Grenades found to be serviceable should be set aside for early re-issue; those found to be other than serviceable should be at once destroyed.

Under no circumstances are salved grenades to be returned to the Base Ammunition Depôts.

PART 3.

68—Care and Storage of Grenades:

Grenades stored in trenches should be kept ready fused with the detonators inserted. Each company in the front line should have a supply on company charge. Company and platoon commanders should be responsible that all grenade depots on their charge are kept up to strength. The company bombing non-commissioned officer should inspect stores daily. Grenades should be distributed in a number of dry and closed bomb proof depots established at frequent intervals in the trenches, in the "grenade trench," and near the head of communication trenches. The principle to be observed is that there should be no more grenades than absolutely necessary in the front line, and that reserves should be echeloned in rear, as near to main lines of communication as possible. The depots should be well marked, easily accessible and kept distinct from other stores. A good type of grenade depot is one built in a T-shaped trench off the main

trench. The grenades should be inclosed in tin-lined boxes, the lid of which must be made airtight, in the depots to prevent deterioration. Old ammunition boxes can be adapted for the purpose.

Conspicuous notice boards to show the position of grenade depots and the way to them should be placed in all trenches.

All grenades sent to the trenches must be constantly turned over. This can be done, if ordinary expenditure is not sufficient, by bringing back grenades from the trenches and using them in grenade training schools.

Stores used for grenades and detonators in the trenches, rest billets, or elsewhere will not be used for any other purpose. The use of naked lights and smoking is forbidden in them. No inflammable material should be allowed in a grenade store. Ventilation must be arranged.

The insertion of detonators should be carried out under the driest possible conditions. The base plug of the Mills' grenade should be well smeared with vaseline before it is screwed home.

A supply of vaseline or mineral jelly should be kept at brigade and battalion grenade dumps and the grenades should be frequently examined and kept free from rust, special attention being paid to the lever and safety pin.

The following may be taken as a rough guide to the number of grenades required by a brigade with two battalions in front line: For each company in front line, 500; in each battalion store, 1,000; in brigade store, 3,000.

69—Storage and Transportation:

There should be no accumulation of primed grenades, even in the bomb-proof subterranean shelters.

Unprimed grenades may be placed in quantities of 400, at a maximum, in the bomb-proof subterranean shelters situated in the rear positions. These localities must not be used as workshops, or to prime grenades. The shelters for the personnel should, whenever possible, be placed not less than 20 meters (21.87 yards) from the grenade recesses.

Grenades are transported either in the cases in which they arrive from the interior (these cases should never be opened before they are used), or in sacks or small boxes. In the latter case, they should be transported without being primed. The detonators and fuses are carried by special men in closed chests.

It is usually only for combat that grenades are bought primed into the first line. The handle grenades are carried six to eight in a sandbag (a man can carry four on his shoulders). The hand grenades (as well as the spherical and lenticular grenades, which still exist in the supplies) are carried in covered chests with compartments. In transporting grenades in wagons or on narrow-gauge railways, only goods of a nondangerous nature should be carried at the same time.

To carry on the above, the unit commander gives more exact instruction, according to the position and the nature of the surroundings, for the replenishment, the reassortment, the distribution, and the storage of grenades, primed and unprimed, as well as for their maintenance and transportation. Thus accidents, other than those caused by the enemy's fire, are avoided, and the confidence of the troops in the handling of grenades is increased. In the depots the best means of storing is to leave the grenades in their original cases. If for any reason they are removed from their cases, the fuses and unset grenades should be arranged separately. Exact instructions should be given for the priming of the grenades in the depots.

The men should be inculcated with the principle that they are to keep and use their grenades with as much care as their other arms. All commanders should see, under their own responsibility, that grenades are not used for any other purpose than that for which they were intended.

PART 4.

70—Method of Carrying:

One hundred spare bags will be kept in each battalion store and 200 in the advanced brigade store. One thousand grenades in each store will be ready in bags. It will be left to the discretion of the officer or noncommissioned officer in charge whether grenades are sent forward in bags or boxes.

Indents.—All indents for grenades to brigade advanced store must bear the following details:

(*a*) Unit.

(*b*) Type and number required.

(*c*) Destination.

(*d*) Urgency or whether merely to complete establishment.

Supplies to battalions will, in every case, be dealt with first.

Fuse grenades.—All grenades in stores previous to the operations will be fused, and the safety pins of No. 5 Mills bombs will be carefully inspected.

Mobile reserve.—The battalion mobile reserve wagons will be brigaded during operations and will be prepared, if necessary, to dump the grenades at the brigade advanced store and afterwards to ply between the divisional store and the brigade store. The latter in the event of the train route being destroyed.

Battalion bombing officers will see that the grenades in the wagons are carefully inspected beforehand. These grenades will not be fused.

The route from divisional store to brigade advanced store should be reconnoitered.

CHAPTER VII.

THE FRENCH GRENADIER AND HIS ARM

In the present European War the grenade is a regular part of the equipment of an infantry soldier, and as all nations have established special schools in which officers and men are required to receive instruction in their construction and use, the manuals of the French, British and German are presented on the following few pages, that we may become familiar with them.

PART 1.

ELEMENTARY TRAINING OF INFANTRYMEN.

Individual Instruction—Instruction of the Grenadier—Instruction of the Squad.

Individual Instruction.

71—School of the Grenadier:

1. Individual instruction is given to all soldiers without exception.

It includes exercises in throwing grenades and also theoretical instruction concerning the manufacture, dismounting, and manipulation of grenades.

Throwing.—The "throwing of grenades" is the basis of the instruction of the grenadier.

Accuracy in throwing is of the greatest importance, for besides the advantage it gives in battle it diminishes the risk of accidents and wasting of grenades.

The moral effect of a grenade bursting in a trench is added to its destructive effect.

The grenade should never be thrown scraping the ground or with the elbow bent. *The fire should be plunging.*

The normal method of throwing the grenade is as indicated in figures 38, 39, 40, 41, 42, 43. This method will be modified

according to the different positions from which the grenade is thrown (kneeling, lying down, from behind an obstacle).

Exercises in grenade throwing.—The men are first exercised in throwing dummy grenades over open ground and at known distances. Trenches are represented by tracing two lines on the ground 1 yard apart, and placed at distances of 20, 25, 30 and 35 yards, etc. (Fig. 44.)

The "throwers" place themselves in trench A. They are exercised in throwing their grenades into trench B. They then increase the range successively to reach C, D, etc.

Fig. 38
Pulling out the catch fuse.

The squads may be divided in half, one at the firing point and the other at the target. The second party returns the grenades

to the first, and so on. Loss of time is thus avoided and the interest of all is increased.

Direction and accuracy can be developed by the employment of targets traced on the ground.

The men should be exercised in throwing grenades from standing, kneeling, and lying-down positions.

Fig. 39

Look toward the objective with the arm extended and the grenade in the right hand.

When the prospective grenadiers have acquired sufficient accuracy they are exercised in throwing grenades from one trench into another, then in advancing along a trench and throwing grenades over traverses.

Dismounting grenades—Manipulation.—The object of this part of the instruction is to teach the soldiers the normal working of the weapon, the accidents that are liable to happen, the dangers

Fig. 40

With left arm held in the direction of the objective, bring the right arm to the rear.

that arise in certain cases, for example, in the case of failure to explode and the precautions that are necessary in handling.

It is strictly forbidden to dismount charged grenades, or even ones that are inactive but with charged detonator.

Consequently, the instruction will be carried out exclusively with dummy grenades made especially for that purpose.

It is absolutely necessary to prepare an instruction trench. It will be sufficient to dig two elements of trenches provided with two traverses separated by an interval of fire at 20 yards apart.

Each time that a command is at rest or in reserve the instructor should immediately prepare an exercise ground. Sunken roads, slopes, natural obstacles that can be adapted to the work in a few hours will serve as shelter for throwing real grenades.

Fig. 41

With left arm in same position, extend right arm to the rear. Turn your eyes on the grenade and make sure that it will not be interfered with during the throwing.

SPECIAL INSTRUCTION

In addition to the common instruction given to all soldiers, the grenadier receives special instruction and undergoes a more complete training.

This instruction includes:—

The making of explosive charges.
The construction of dummy grenades.
The utilization of enemy grenades and detonators.
The handling of low-power trench mortars.

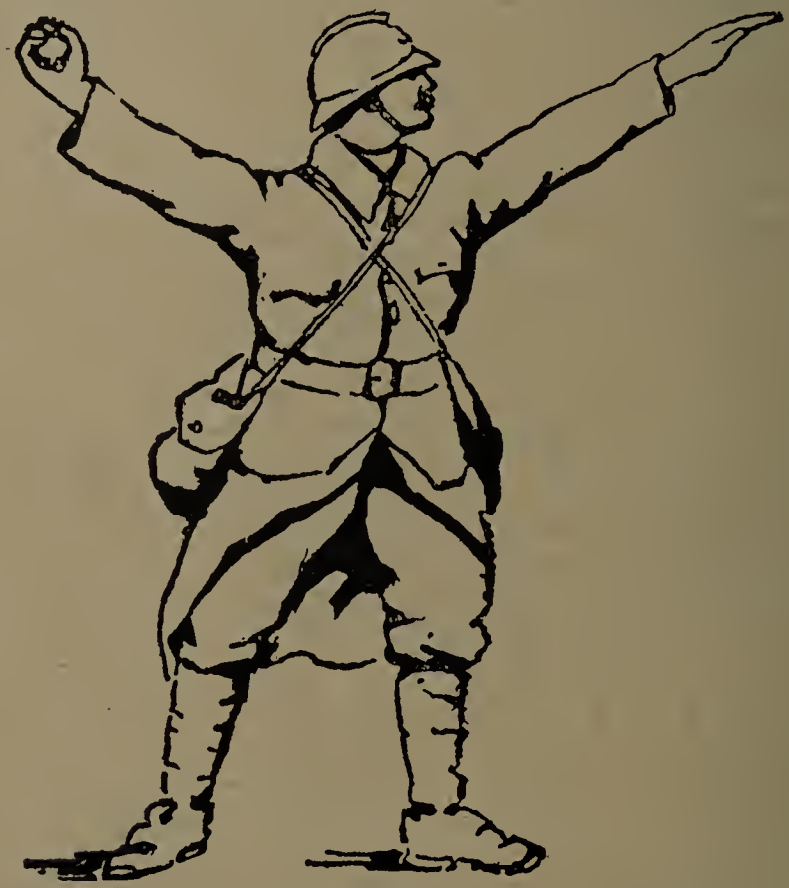


Fig. 42

Look again at the objective. Describe an arc of a circle in the vertical plane with the right arm.

The object of the special training of grenadiers is to make the throwers quick and confident in their direction, and the instructors capable of setting the example to their comrades and of organizing the grenade combat.

Grenadiers should be especially exercised in firing rifle grenades. Continually on the lookout and prompt to seize favorable

opportunities, they will inflict appreciable losses on the enemy daily.

Fig. 43

Throw the grenade, the right shoulder and the body following the movement of the right arm. The left arm follows the left shoulder, which is held back. The grenade will go in the direction in which the left arm pointed.

PART 2.

72—Instruction of the Grenadier Squad:

The object of squad instruction is:—

To teach any squad of grenadiers (particularly the first squad of each platoon) to prepare for grenade combat and to pass

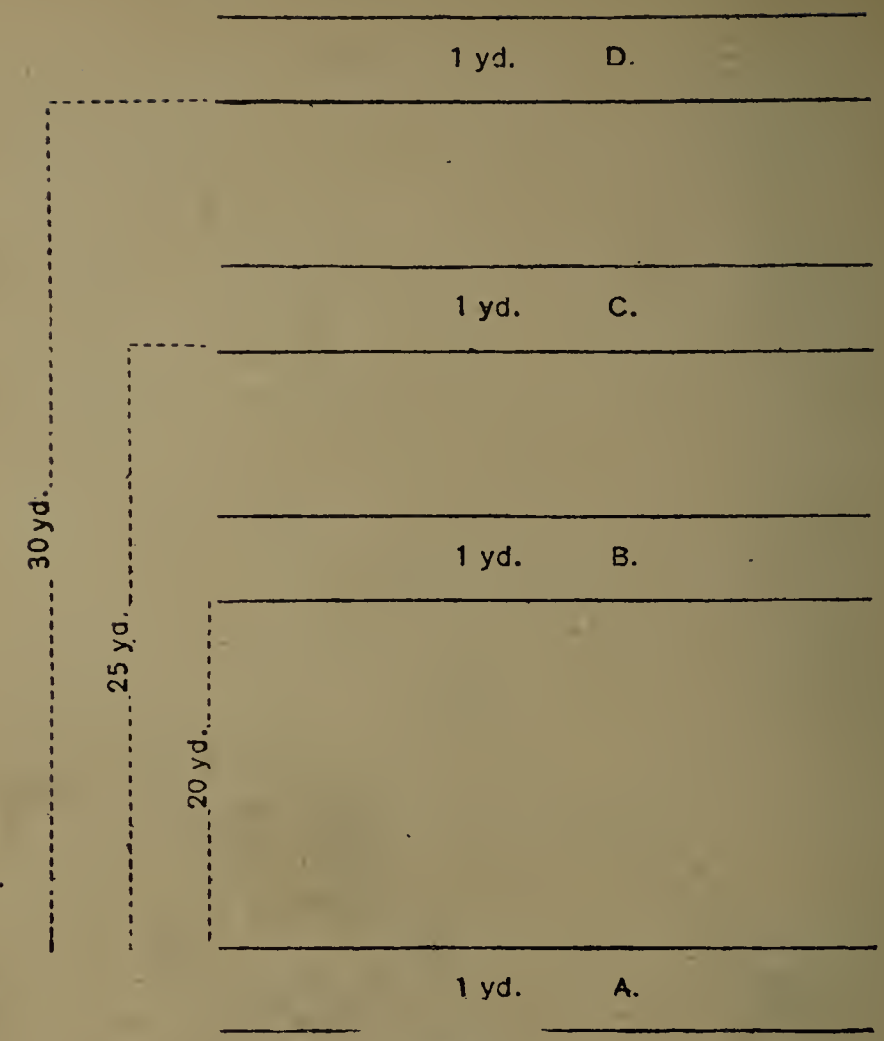


Fig. 44

quickly to that mode of fighting whenever circumstances permit.

To teach the squad to effect a surprise attack with grenades.

As a rule, the men comprising a squad of grenadiers are divided for battle as follows:

Throwers.
Carriers.
Assistant grenadiers (formerly called riflemen).

Each grenadier being capable of immediately filling any one of these rôles upon being designated as thrower, carrier, or assistant.

The squad of 1 corporal and 7 grenadiers will then consist, under its squad leader, for example, of 2 throwers, 2 carriers, 2 assistants, and 1 spare grenadier. Or it may sometimes fight in two reliefs of 3 grenadiers each, one commanded by the corporal and the other by the most energetic grenadier.

More important groups will often be formed under the orders of a sergeant or a grenadier officer to carry a more extended point of resistance. Sometimes all the grenadiers of a company or a battalion will be grouped together.

The combat of such a group is the combination of the partial combats conducted by the groups of four or eight grenadiers, between which the grenadier officer has divided the whole objective, each being assigned to some carefully chosen point.

The instruction of the small squad is then the tactical basis of grenade combat.

73—Rôle of the Squad Leader:

The squad leader directs the combat; he distributes the men according to their qaulifications, places them in the trenches or communicating trenches so that they will not be crowded, organizes the reliefs of throwers and carriers; he looks after the replenishment of grenades.

The squad leader seizes promptly every occasion to advance; if the advance becomes impossible, he prepares to defend the ground foot by foot, multiplying the barriers.

The grenadier officer, being in command of a much larger group, has two principal tasks:

First. To reconnoiter the objective; to distribute the squads or groups.

Second. To supply the squads.

The second task demands the greatest energy, discernment, and initiative.

74—Rôle of Each Soldier in a Squad Fighting with Grenades:

Throwers.—The "throwers" should have their hands entirely free in order to manipulate the grenades without difficulty; they carry the rifle slung on the shoulder during combat.

For defense, they are provided in addition with a pistol and a trench knife.

The "throwers" will not always be able to carry the rifle when the fight is not to be followed up, as in the execution of a surprise attack.

Grenade carriers.—The "carriers" look after the replenishment of grenades. They replace the "throwers" if the latter are put out of action. They are armed alike.

Grenadier assistants.—The "assistants" should be chosen from among the most decided and alert men; they should be good shots and skillful in the use of the bayonet.

Their duty consists in looking after the security of the "throwers." They are sometimes called "scouts."

In a frontal attack over open ground they support the "throwers" and protect them with their fire.

In the communicating trenches they precede the "throwers" and pass around the traverses or bends, ready to stop any offensive return of the enemy. They endeavor to report the location of the fall of the grenades, to aid in correcting the fire, and signal to their squad leader the instant that advance is possible.

When further advance is impossible they notify their chief. Without waiting for orders a barrier of sand bags is thrown up as soon as possible and the "assistant grenadiers" take position to open fire.

In street fighting they watch especially the doors and windows.

75—Formation on the March of Squads Designated for Combat:

These squads usually advance in the same manner as patrols and reconnaissance parties.

The squad leader takes the place from which he can best control and direct his squad.

The "assistant grenadiers" are directed to reconnoiter the front and flanks and to protect the other grenadiers in case the enemy is encountered.

In crossing open ground the squads advance as skirmishers. The assistants are distributed in the line and are grouped particularly on the wings to support the grenadiers; in case of meeting the enemy the assistants reconnoitering the march rejoin the line.

In marching in the communicating trenches the squads form

in single file in the following order: "Assistants," "throwers," "carriers."

76—Squad Training:

Squad training is held on a prepared drill ground.

The command is taught to divide itself quickly into assistant grenadiers, throwers, and carriers, and they are instructed in the part that each of these should take under the different circumstances of combat, which are indicated later.

The men should always work in complete silence, communicating as far as possible by gestures and signals.

It is much more important to have squads of grenadiers of average ability but trained to work together than to have a number of highly developed individuals. It is a great mistake to pay attention only to the individual instruction of the grenadier and to believe that the efficiency of the squad will follow naturally. Nothing is more difficult than to properly coordinate the action of the men in the same group, or of groups in the same combat.

PART 3.

77—The French Grenade Manual:

Classification.—All grenades in use at the present time are provided with *time fuses* which cause explosion a certain number of seconds (average 5) after they are lighted.

Grenades for defensive action must be distinguished from *grenades for offensive action.* In combat at close quarters in grenades may be used without exposing the grenadier to danger from the fragments. The danger zone of these grenades is limited, extending not more than 8 to 10 yards beyond the bursting point. *Defensive grenades* burst in a shower of deadly fragments and are effectual at a distance of more than 110 yards from the point of explosion. They should never be thrown from a position unprotected from fragments which might fly back.

Grenades are thrown either by *hand* or *rifle,* the latter being thrown with the aid of a "discharger," a special device fitted to the rifle. Finally, there are *suffocating, smoke producing,* and *incendiary* grenades, for special uses.

Primers in use are as follows: *Metal primer* and *automatic primer, model 1916 B.* The second is intended to supersede the first.

The *metal primer* (see fig. 48) is a percussion primer. After removing the safety cap strike the grenade on the heel of the boot, rifle stock, or other hard object. This brings the primer into contact with the striker, thus igniting the slow match which in turn fires the detonator and causes the explosion. The safety cap prevents accidental puncture of the primer case before actual and intended use of the grenade.

A grenade must always be thrown immediately upon lighting and without stopping to verify its ignition.

The *automatic primer* (fig. 47) acts on a different principle. Two fuses are simultaneously struck by a percussion spring, in form of a small pincer, which is released by moving the bolt. This bolt is automatically moved by raising the lever, which is held in safety position by the pin (with ring) and, after the pin is withdrawn, by the hand holding lever and grenade.

To throw a grenade supplied with an automatic primer.— First. Hold the grenade in the hollow of the right hand, primer end up, the ring turned in and near the base of the thumb. The lever then lies in the palm of the hand and may be held firmly without effort. Second. By means of the ring withdraw the pin with the left hand. The grenade is now set at "ready" and care must be taken to hold the lever down. Third. Sight the target over the extended left arm and throw the grenade as prescribed in "Instructions for grenade figthing."

Remarks.—Hold the grenade well up toward the primer so as to hold the lever firmly in position. Do not remove the pin until just before throwing the grenade. After removing the pin keep the hand closed but not clenched. The effort necessary to hold the lever down is slight, but must be continuous while the grenade is set at "ready."

It is forbidden to set off the fuse of a grenade before throwing under pretext that the match requires so long to burn.

The grenadier must avoid continuous holding of a grenade set at "ready," and must particularly avoid walking, as a false

If more than 6 per cent. misfire, the fact should be reported and the mark on the body of the primer indicated.

79—Grenades in Service:

The principal grenades are: (1) The O F 1915 (offensive, fuse); (2) the F 1915 (defensive, fuse); (3) the citron C F; (4) the suffocating, model 1916; (5) the A B 1916 (incendiary, smoke producing, fuse); (6) the rifle V B (fuse); (7) the rifle D R (percussion).

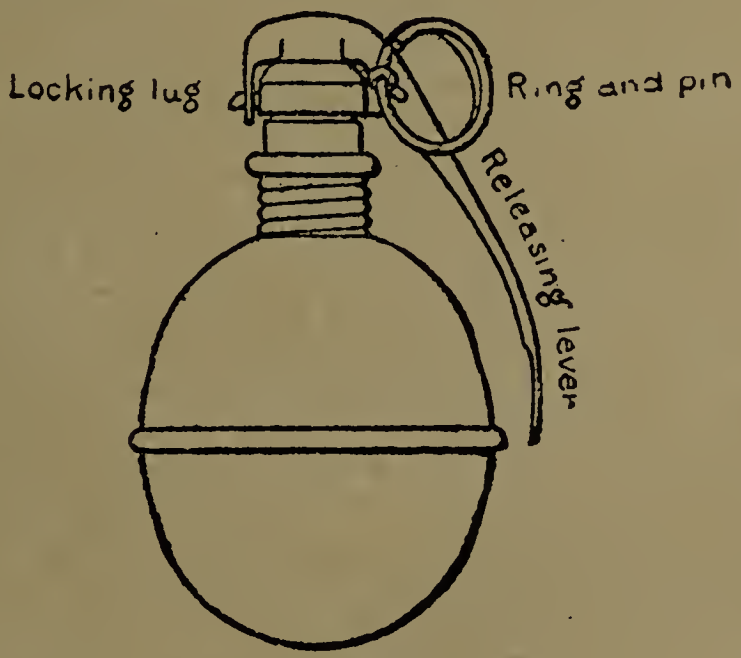


Fig. 47
O F grenade with automatic primer.

First. Grenade O F 1915.—Fuse grenade, for offensive action. Composition metal, ovoid envelope 0.118 inch thick, filled with 5 ounces, 127 grains of cheddite. (Fig. 47.) Automatic or metal priming cap.

Shipment to the armies is made in cases containing either 200 loaded bodies or 50 priming caps. They can be assembled in any suitable place, after which the primed weapon may be issued to the troops. Total weight, about one-half pound.

Second. Grenade F, 1915.—Fuse grenade for defensive action. Cast iron, ovoid envelope, with exterior grooves to facilitate fragmentation. Either the metal or automatic primer may be mounted on this grenade. (Fig. 48.) Shipment to the armies is made in cases containing either 100 loaded bodies or 50 priming caps. They are loaded, primed, and assembled at Army depots before issuing to the troops. Charge 2 oz., 50.8 grains cheddite. Total weight, 1 lb., 5 oz., 70.5 grains.

Third. Citron C F.—Fuse grenade for defensive action. Simple variety of F^1. Special percussion primer similar to the metal primer. This grenade can not be operated by an automatic primer.

Fourth. Suffocating grenade, Model 1916.—Fuse grenade. Leaded iron, ovoid body. Percussion primer. These devices are suffocating and tear producing, but little poisonous. They render inclosed or badly ventilated areas untenable and may be suitably used in forcing the enemy to evacuate shelters, caves, etc. The grenade, which has no explosive material except the detonator, may be safely thrown a distance of 15 yards in open country. Avoid throwing against the wind, as the suffocating gases would in that event be blown back to the thrower. Shipment to the armies is made in case of 25 grenades loaded and primed. Charge, 7 oz., 33.5 grains of special liquid. Weight, 14 oz., 47 grains each.

Fifth. Grenade A B, 1916.—Offensive, incendiary, smoke producing fuse grenade (50). Spherical, composition metal body, metal primer, and method of using the same as F. Does not produce a dangerous explosion, but projects flaming particles within a radius of 15 to 20 yards. Should not be thrown against the wind, as the composition generates a dense smoke. Twenty grenades will produce quite a thick cloud. An unexploded grenade of this type may be picked up and thrown again without danger to the user, after the primer has been changed. Shipment to armies is made in cases of 50 grenades ready for use. Charge, 1 lb., 1 oz., 277.5 grains of inflammable composition. Total weight, 1 lb., 9 oz., 94.95 grains.

Rifle grenades.—The Vivèn Bessières grenade (V B) is thrown with the aid of a "discharger" (trombion) fitted on an infantry

rifle, using the service cartridge. Another device is used on the rifle with a special blank cartridge for firing the D R grenade. This device is called a mandrel. The rifle may be fired from

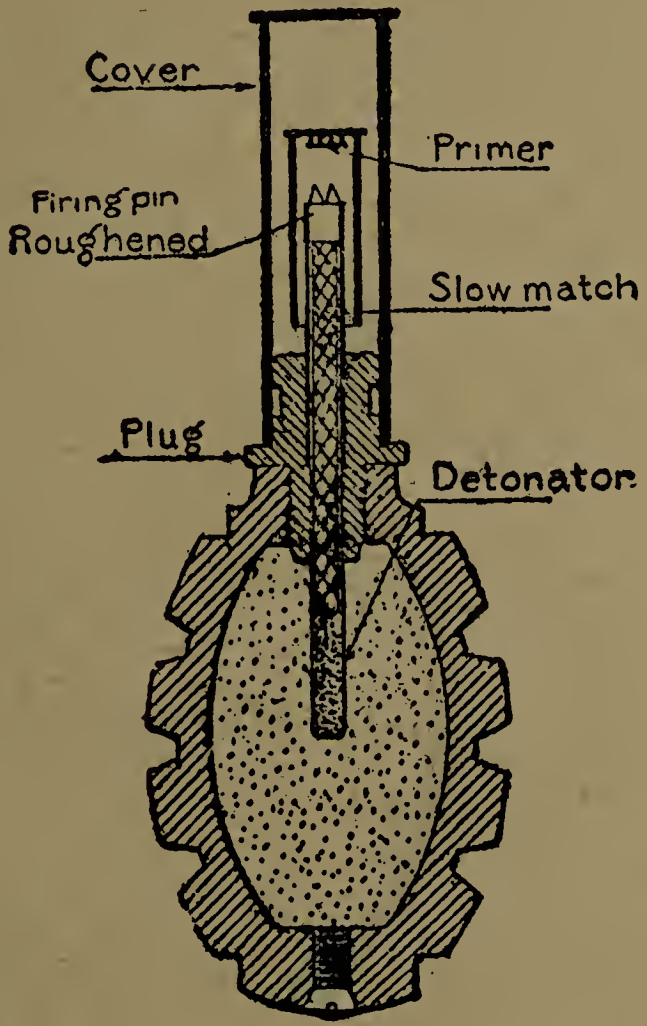


Fig. 48
F1 grenade with metal primer.

the shoulder (V B), but preferably from the ground or in the position "Charge bayonets," or on a frame. The maximum ranges of the two types (208 and 383 yards) may be secured

by aiming at an angle of 45°. The high angle of fall makes it possible to obtain plunging fire on the trenches.

Sixth. Grenade V B.—Cast-iron body, with interior grooves to facilitate fragmentation, grooves containing two tubes permanently held in place; one lateral, which receives the igniter and

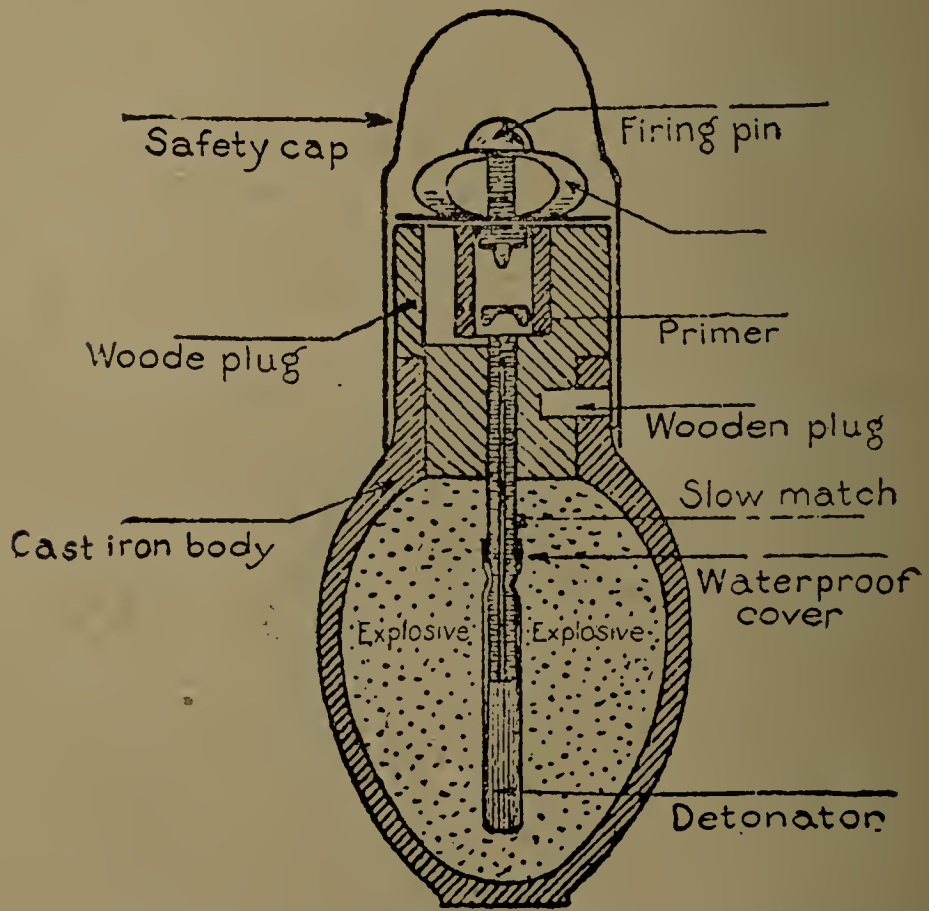


Fig. 49

detonator, and one central through which the bullet passes. The bullet strikes the primer which ignites the fuse, and at the same time, the gases of the cartridge expand into the "discharger" and project the grenade.

Method of using.—Adjust the "discharger" securely in the muzzle of the rifle. Insert the V B grenade as far as it will go, its base resting on the bottom of the "discharger," which latter is shaped like a truncated cone. Load the rifle with a regulation ball cartridge and fire.

Advice and instructions.—Keep the interior of the "discharger" perfectly clean and slightly greased. Remove all rust from the body of the grenade. The primer should not project

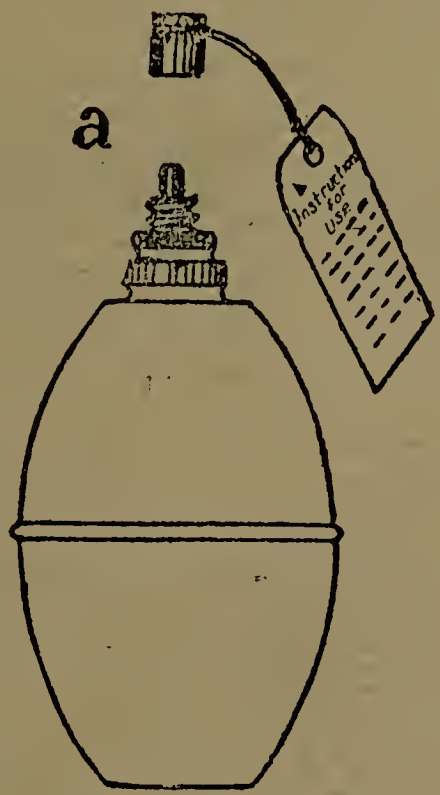


Fig. 50

too far into the central canal, as it might be carried away by the ball without having acted on the fuse. Shipment to the armies is made in cases of 100 grenades ready to use. Weight of one case, 154 lbs. A case with handles, to contain 20 grenades, has been adopted. Weight of "discharger" about 3⅓ lbs.

Interior diameter, 1.96 in. Weight of the grenade loaded, 1 lb., 329 grains. Weight of charge, 2 oz., 50.8 grains. Period of combustion of slow match, 8 seconds with an allowance of +1 second. The gradual heating of the rifle by firing increases the range (about 20 yards at an angle of 45°). The firing table below is approximate and allows for 10 to 15 yards deviation. This table shows that if the explosion takes place 8 seconds after firing it occurs at the minimum distance as soon as it strikes the earth, and about 2½ seconds after striking the earth, if at the maximum distance.

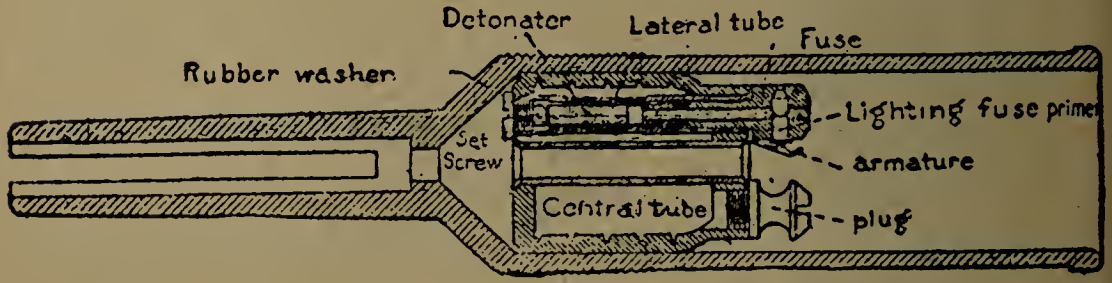


Fig. 51

Seventh. Grenade D R.—This grenade differs from the V B on the following points:

It fits onto a "mandrel" instead of being put into a discharger. It has a percussion fuse. It is fired by a special blank cartridge, instead of an ordinary ball cartridge. It is more cumbersome, but has twice the range and is more effective. It has a cast-iron body, elongated toward the front by a wooden ogive and a fuse and toward the rear by a swaged sheet-iron cylinder base with four vanes. This cylinder incloses the special cartridge, held in place by a pasteboard plug. Fire with the butt resting on the ground or in the position "charge bayonets," or from the special metal frame. The range is found by varying the angle at which the rifle is held, or, preferably, by maintaining an angle of 45° and regulating the volume of the expansion chamber. This is done by pushing the regulating pin into a hole corresponding with the desired distance. This pin controls the setting of the grenade on the mandrel.

Method of using.—Fix the mandrel on the rifle, regulate the angle and regulating pin; remove the pasteboard plug, extract the cartridge, and fix the grenade on the mandrel; remove the fuse safety pin; load the rifle with the special cartridge, and fire.

Advice and instructions.—Never fire with a ball cartridge. Lubricate all contact surfaces. Straighten any vanes which may have been bent. Shipment to armies is made in cases of 24,

Firing table.

Firing angle, in degrees.	Range, in meters.	Time of flight, in seconds.
45	590	5.2
50	580	5.6
55	554	6
60	512	6.3
65	453	6.6
70	380	6.8
75	295	7
80	203	7.2
85	102	7.3

ready to use. Weight of one grenade, 1 lb., 4 oz., 276 grains, including 3 oz. of explosive. Maximum range, about 390 yards, to be obtained by firing at an angle of 42°, with the grenade shoved all the way down.

Eighth. Practice or blank grenades.—Distinctive colors—*Painted gray*: Loaded for service. *Painted white*: Weighted with sand, with an *active fuse*. *Painted red*: Filled and provided with blank fuses, or with none at all. Primers stamped with a cross: Active, to be used only with unloaded grenades. Primers pierced in several places: Inactive.

A wooden ball cartridge should be used when practicing with an active V B grenade, and, in order to insure ignition, the primer may be fixed at an angle of 45°. Never give it that angle when using a regular ball cartridge.

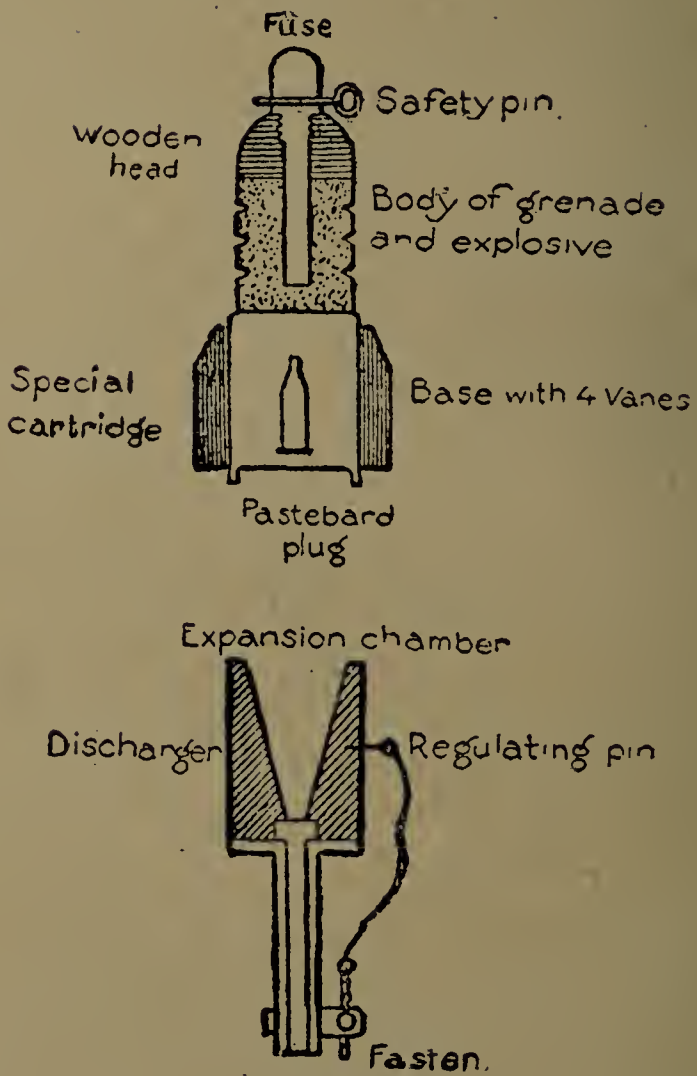


Fig. 52

Grenade and "mandrel" D R.

CHAPTER VIII.

DESCRIPTION OF BRITISH GRENADES AND INSTRUCTIONS FOR THEIR USE

PART 1.

General Remarks.

A. The following types of grenades are now in use: Mills grenade, grenade, hand, No. 5; Hales rifle grenade (with wind vane), grenade, rifle, No. 3; Hales rifle grenade (vaneless), grenade, rifle, No. 20; Mills grenade to be fired from rifle, grenade, No. 23.

B. The following grenades should be available shortly: Pippin rifle grenade, grenade, rifle, No. 22; Hales rifle grenade (vaneless improved), grenade, rifle, No. 24.

PART 2.

DESCRIPTION OF VARIOUS GRENADES.

80—Hales Rifle Grenade, Short Rifle, No. 3, Mark I (Percussion):

Weight complete, 1 pound 5 ounces. Mean maximum range, 185 yards.

Description. (See fig. 53.)

Body.—Serrated steel, filled with explosives. Down the center of the explosive is a brass tube into the forward end of which the detonator is inserted. The body is closed by the base piece. This carries the striker pellet, two retaining bolts, wind vane, releasing socket, and safety pin. To the base piece is fixed a base plug carrying the spring clip and a 10-inch steel rod.

Detonator holder.—Consists of a special brass tube which

screws into the head of the grenade. It is 2½ inches long and contains a detonator and detonator cap. Until the detonator is inserted the head of the grenade is closed by an ebonite screw plug.

Cartridge.—A special blank cartridge is supplied to fire the grenade.

Action.—The action of the grenade on being fired is as follows: The wind vane revolves as the grenade travels through the air; after a few turns of the vane the retaining bolts are no longer held in position by its inner surface and fall out; on impact the striker pettet sets forward against the creep spring onto the detonator cap, thus firing the grenade.

This grenade is very safe to handle, as it can not be fired by knocking or dropping on the ground; it must travel through the air some distance before the retaining bolts fall out.

Instructions.—To prepare for use:

1. Holding the grenade head down so as to make certain that the needle is not free, remove the ebonite screw plug.

2. If correct, screw in the detonator holder.

To fire:

1. Lower the rod into the barrel of the rifle, and clip over the muzzle.

2. Load the rifle with the special blank cartridge.

3. Immediately before firing withdraw the safety pin.

If, after the safety pin has been removed, the grenade is not used, the safety pin may be replaced if the wind vane has not unscrewed and uncovered the two retaining bolts; but if these are uncovered the grenade is in a dangerously sensitive condition, and if so found should be destroyed.

Special precautions to be adopted when firing No. 3 rifle grenade (either with or without pin on wind vane):

1. The grenade should be tapped on the palm of the hand before inserting the detonator, to insure that the striker pellet is properly held in place by the retaining bolts.

2. The wind vane and the releasing socket must not be tampered with.

3. The safety pin must be removed before the grenade has been inserted in the rifle.

4. The detonator holder of No. 2 and No. 3 grenades are of slightly different lengths, but otherwise very similar (see figs. 53 and 54). Care should be taken not to mix them up. A No. 2 detonator holder in a No. 3 grenade would probably cause a blind; the correct detonator holders are supplied in the grenade box.

5. *The grenade must not be fired with a cartridge with a bullet in it (ball cartridge), as this may burst the rifle.*

6. The rod should be oiled, but only slightly, before placing it in the barrel of rifle.

Inspection.—The following points should be noticed:

1. That the wind vane is covering the retaining bolts.

2. That the releasing socket and safety pin are correctly in place.

3. That the striker pellet is held correctly by the retaining bolts, which fit into a groove in it and should prevent it from moving.

4. That the creep spring is in position over the striker pellet.

5. That the screw thread and cavity for the detonator holder are clean and clear.

6. That the rod is straight and clean.

7. That the metal at the lower end of the detonator holder is correctly turned in over the detonator cap, so that the latter is securely held. If it is not, the cap may come out on the shock of discharge, strike the needle, and so cause a premature.

Packing.—The wooden box provided contains 12 grenades, 12 "detonators, rifle grenades" (which are detonator holders complete with detonators), and 12 special blank cartridges in a tin box.

81—Grenade, Hand, No. 5, Mark I, or Mills' Hand Grenade (Time):

Weight complete, 1 pound 6½ ounces.

Description. (See fig. 54.)

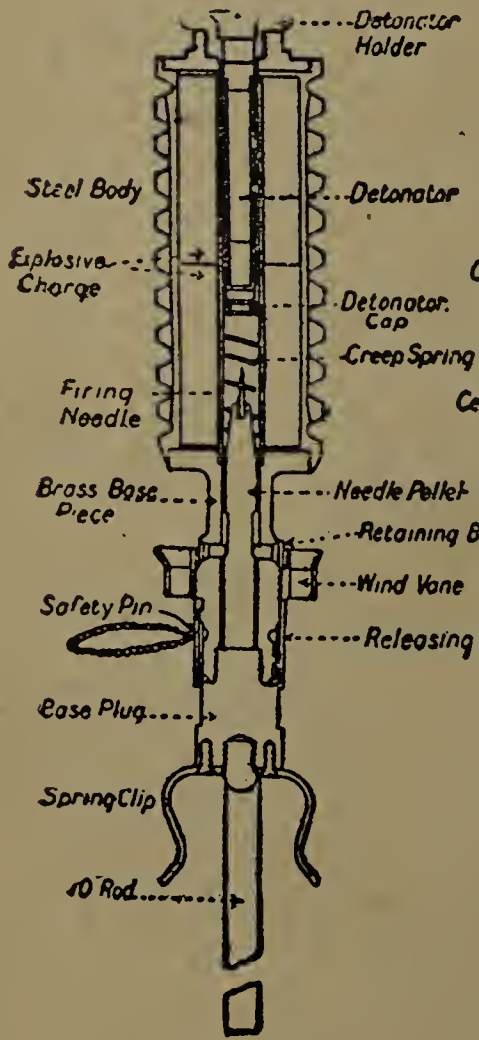
Body.—Cast iron, serated to provide numerous missiles on detonation. Into one end is screwed a center piece with separate recesses for the striker and the detonator.

The striker is kept cocked against its spring by its head catching on the end of the striker lever when the latter is lying against the body of the grenade.

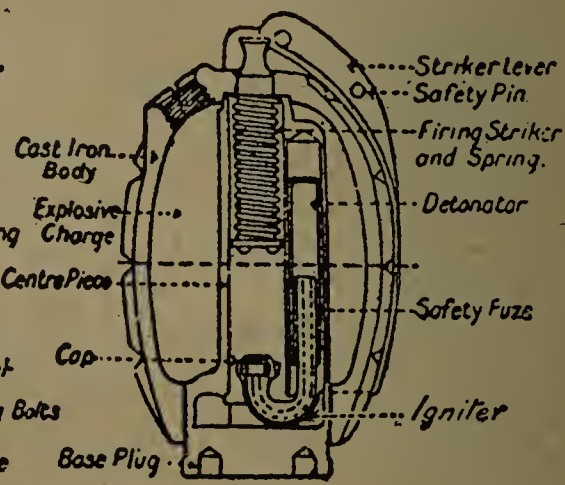
The lever is retained in this position by the safety pin.

HALES RIFLE GRENADES

GRENADE, :303" SHORT RIFLE. No. 3. FIG. 53.



GRENADE, HAND. No. 5. FIG. 54.



Igniter.—This is a separate unit, consisting of cap, cap chamber, safety fuse, and detonator (No. 6, which is 1⅜ inches long, No. 8 being 2⅛ inches).

On withdrawal of the safety pin, the lever swings outward under the pull of the striker spring, thus releasing the striker which fires the cap. The safety fuse burns about five seconds and then fires the detonator.

INSTRUCTIONS.

To prepare for use:

1. Examine the safety pin and see that it is easy to withdraw.

2. Unscrew the base plug and insert igniter.

3. Screw in the base plug with the key provided, taking care that it is screwed home. The lead base plugs which are sometimes supplied must be screwed in with care, otherwise the projections may be injured.

To throw:

1. Hold the grenade in the right hand in such a position that the lever is held securely against the body of the grenade by the fingers, with the lever along the second joints of the fingers.

2. Withdraw the safety pin with the left hand, using a hook if preferred, still keeping a firm grip on the lever.

3. Throw the grenade.

Special precautions:

1. Do not release the lever before throwing the grenade.

2. It is essential that the lever should be held securely against the body of the grenade, otherwise the collar which holds back the striker may release it and so ignite the fuse.

3. The precautions against using grenades as filled grenades after they have been used as dummies for practice is particularly applicable to this type.

4. Before inserting igniter see that the safety pin is not broken or badly corroded, and that the fuse is not cracked or damaged, as these defects may accelerate time of burning.

Inspection.—The following points should be noticed:

1. That there are two striking points on the perimeter of the lower end of the striker, and not one central point. A central point as used in Stoke's mortar bombs will cause a premature explosion in a Mills grenade.

2. That the safety split pin is not broken or badly corroded and

that the ends are correctly splayed, so that the pin can not be jolted out, but yet is not too difficult to withdraw.

3. That the jaws of the lever are a good fit and hold the top of the striker correctly.

4. That the wax seal around the top of the striker is unbroken.

5. That the mouth of the detonator is closely crimped around the safety fuse, so that no flash can enter the detonator except through the fuse.

6. That the fuse is in good condition and not cracked or damaged by being bent, and is not loose in the cap.

It has been found by experiment that no danger attaches to the partition between the recesses for the striker and the detonator being thin or holed. Even with the partition completely cut away no prematures have taken place.

Mills's grenades for use as rifle grenades must have solid, and not recessed, base plugs.

Packing.—The grenades are packed 12 in a wooden box, with a cylinder containing 12 igniters.

82—Vaneless Rifle Grenade, No. 20:

[Weight complete, 1 pound 6 ounces. Mean maximum range, 250 yards.]

DESCRIPTION (See Fig. 55).

This grenade is an improved form of No. 3 without the wind vane and spring clip. The safety pin is below the releasing collar.

Body.—Serrated steel filled with explosive. Down the center of the explosive is a brass tube, into the forward end of which the detonator is inserted. The body is closed by the base piece. This carries the striker pellet, two retaining bolts, releasing socket, and safety pin. To the base piece is fixed a 10-inch rod.

Detonator holder.—Consists of a special brass tube which screws into the head of the grenade. It contains a detonator and detonator cap. Until the detonator holder is inserted the head of the grenade is closed by an ebonite screw plug.

Cartridge.—A special blank cartridge is supplied to fire the grenade.

Action.—On the shock of discharge, the releasing socket sets back; the retaining bolts are no longer held in position by its inner surface, and fall out. On impact the striker pellet sets forward against the creep spring onto the detonator cap, thus firing the grenade.

INSTRUCTIONS.

To prepare for use:

1. Holding the grenade head downward, remove the ebonite screw plug, and tap the grenade on the hand, so as to make certain that the striker is not free.

2. If correct, screw in the detonator holder.

To fire:

1. Lower the rod into the barrel of the rifle.

2. Load the rifle with the special cartridge.

3. Immediately before firing withdraw the safety pin. If the grenade is not fired the safety pin may be replaced.

Special precautions:

1. The grenade should be tapped on the palm of the hand before inserting the detonator holder, to insure that the striker pellet is properly held in place by the retaining bolts.

2. The releasing socket must not be tampered with.

3. After withdrawing the safety pin it should be noticed that the releasing socket is still in its right position; it may slip back (thus releasing the retaining bolts) if it has not been properly secured over the retaining rim during manufacture. *A grenade in this condition is dangerous, and would probably explode prematurely at the muzzle.*

4. The safety pin must not be withdrawn before the grenade has been inserted in the rifle.

5. *The grenade must not be fired with a cartridge with a bullet in it (ball cartridge), as this may burst the rifle.*

6. The rod should be oiled, but only slightly, before placing it in the barrel.

7. The detonator holders for grenades No. 2 and No. 20 are of slightly different lengths, but otherwise very similar. Care should be taken not to mix them up; a No. 2 detonator holder in a No. 20 grenade would probably lead to a blind. The correct detonator holders complete with detonators are supplied in the grenade box.

Inspection.—The following points should be noticed:

1. That the releasing socket and safety pin are correctly in place.

2. That the striker pellet is correctly held by the retaining bolts, which fit into a groove in it and should prevent it from moving.

3. That the creep spring is in position over the striker pellet.

4. That the screw thread and cavity for the detonator are clean and clear.

5. That the rod is straight and clean.

6. That the metal at the lower end of the detonator tube is correctly turned in over the detonator cap, so that the latter is securely held. If it is not, the cap may come out on the shock of discharge, strike the needle and so cause a premature.

Packing.—The wooden box provided contains 12 grenades, 12 detonator holders (containing detonators) in a tin box, and 12 special blank cartridges in a tin box.

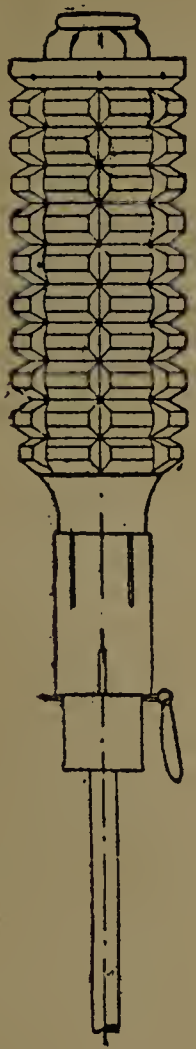
83—Pippin Rifle Grenade, No. 22, Mark I:

[Weight complete, 1 pound 9¼ ounces. Mean maximum range, 300 yards. This is a modification of the extemporized "Newton" grenade.]

DESCRIPTION (See Figs. 57 and 58).*

Body.—The grenade consists of a cast-iron, stream-line body with a flat head, serrated on the outside. A 15-inch rod is screwed into the pointed end and fitted with a copper gas check. In the center of the flat head is a hole; into this, after the grenade has been filled with ammonal, a paper tube with a solid end is forced down and waxed in. This tube takes the special detonator.

* The final pattern of No. 22 is not yet definitely settled, and the description given here may require modification later.



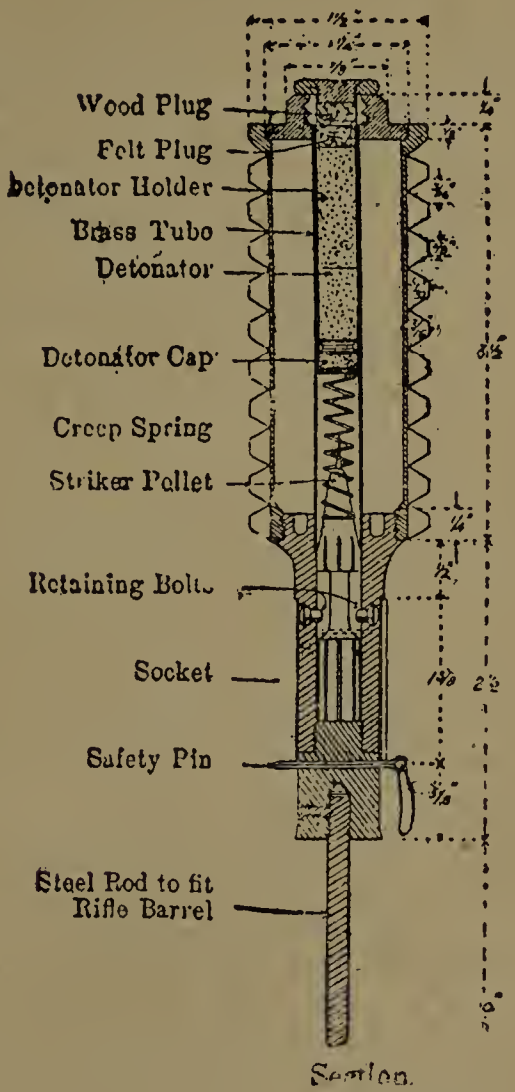

Wood Plug
Felt Plug
Detonator Holder
Brass Tube
Detonator
Detonator Cap
Creep Spring
Striker Pellet
Retaining Bolt
Socket
Safety Pin
Steel Rod to fit Rifle Barrel

Fig. 56

Fig. 55

Cap.—Over the head of the grenade is a detachable pressed steel cap, the sides of which have been cut away, leaving four projecting lugs, each with a formed hole in it. These lugs fit over four projections cast on the body. The cap is fitted with a safety pin.

Detonator holder.—Consists of an ordinary .303 rifle cartridge case before undergoing the operation of necking, fitted with a percussion cap only. Inside is an ordinary No. 8 detonator packed round with waxed paper, with the end spun over. A tin safety strip is fitted to the base of the cartridge case which covers the cap; this must be perforated by the striking before it can reach the cap.

Action.—The grenade, owing to the rod, falls on its head. On coming in contact with the ground the steel cap is driven up and forces the striker through the safety strip into the cap of the cartridge.

INSTRUCTIONS.

To prepare for use:

1. Remove the steel cap by the lever supplied with each box of grenades.

2. Push the detonator holder down into the grenade until the rim of the cartridge case comes in contact with the body.

3. Replace the steel cap.

NOTE.—The safety pin must not be removed during the above operations.

To fire:

1. Lower the rod into the barrel of the rifle.

2. Load the rifle with the special cartridge.

3. Immediately before firing, withdraw the safety pin.

Special precautions:

1. The safety pin must not be removed before the grenade has been inserted in the rifle.

2. The grenade must not be fired with a cartridge with a bullet in it (ball cartridge), as this may burst the rifle.

3. Only the special detonator holders and cartridges provided must be used.

4. The rod should be oiled, but only slightly, before placing it in the barrel of the rifle.

5. Owing to the grenade being armed as soon as the safety pin has been removed it is advisable to fire it from behind cover.

Packing.—The wooden box provided contains 12 grenades, 12 detonator holders with detonators in a tin box, and 12 rifle grenade cartridges in another tin box.

84—Mills' Rifle Grenade, No. 23, Mark I:

[Weight, complete, 1 pound 8½ ounces; mean maximum range (with 6-inch rod), 90 yards.]

Description (See Figs. 59 and 60).

Body.—This is a No. 5 (Mills) grenade with a short rod, 5½-6 inches long, screwed into the base plug of the grenade. The hole in the base plug is filled with wax or luting when issued, in order to keep the grenade damp-proof in case the rod is not required.

Cartridge.—A special blank cartridge is supplied to fire the grenade.

Ring attachment.—In order to keep the lever of the grenade in place after the safety pin has been removed previous to firing, a ring attachment is fixed to the rifle by means of the bayonet; it is so constructed that it can be used either with the long or short bayonet.

This attachment can not be used with the long rifle (owing to the lack of space between the bayonet and the bore of the rifle). A special attachment is necessary in this case to take the place of the bayonet.

Action.—When the grenade is shot out of the rifle the lever is no longer held down by the ring attachment and the normal (Mills) grenade action follows.

Pippin Rifle Grenade, No. 22.
Half Size.

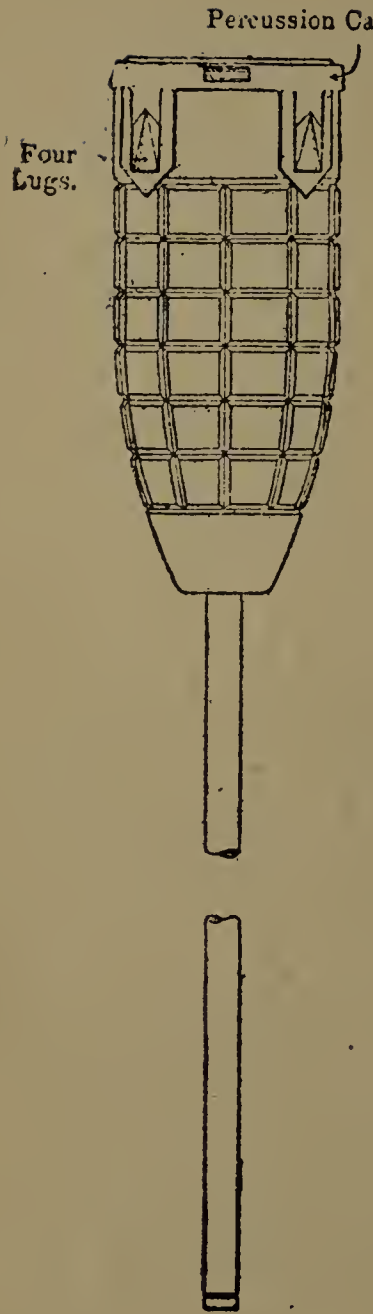


Fig. 57

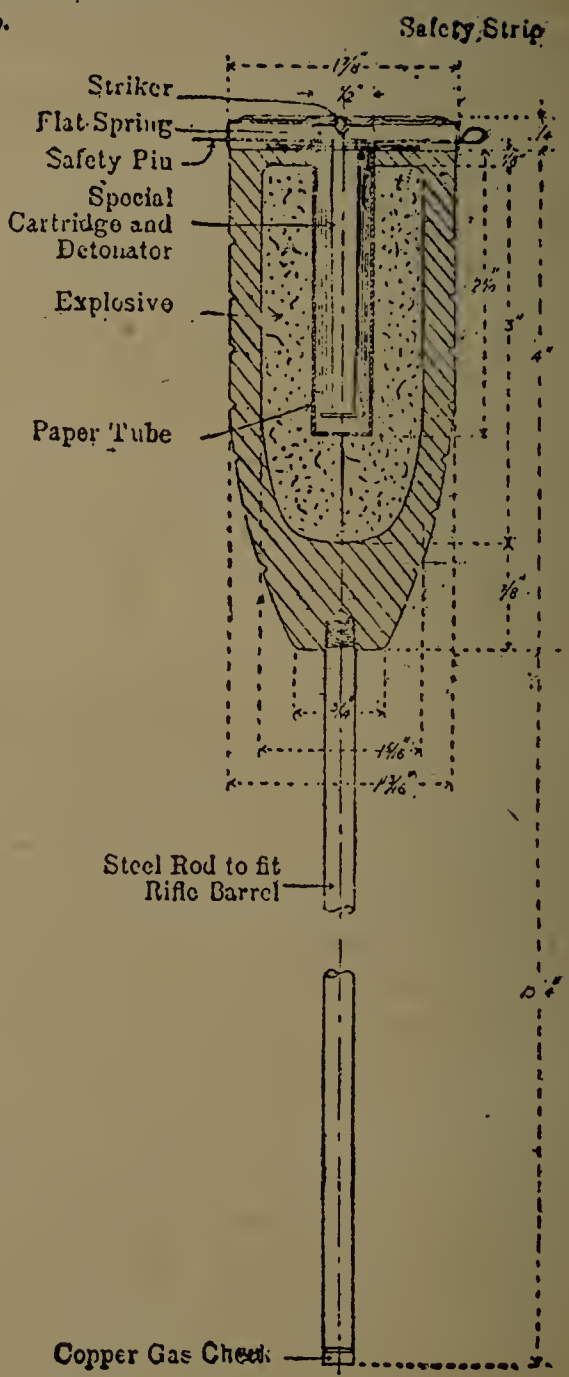


Fig. 58

With a 5½-inch rod the maximum range is 80 yards with the rifle at an elevation of 45°.

Variation of range is obtained by altering the elevation of the rifle. The rifle may be fired from the shoulder or hip, as there is very little recoil.

The grenade without the rod can be used as a hand grenade.

INSTRUCTIONS.

To prepare for use:

1. Unscrew the base plug and insert the igniter.

2. Screw in the base plug with the key provided, taking care that it is screwed home.

3. When required as a rifle, screw in the short rod.

To fire:

1. Fix the ring attachment to the bayonet.

2. Fix the bayonet.

3. Lower the rod into the rifle until the grenade is within the ring attachment and the lever is held by the ring.

4. Load the rifle with the special cartridge.

5. Immediately before firing, withdraw the safety pin.

Special precautions:

1. When inserting the igniter see that the fuse is not cracked or damaged, as this may accelerate time of burning.

2. The lever must be held securely by the ring against the body of the grenade.

3. The safety pin must not be withdrawn before the grenade is inserted in the ring attachment.

4. The grenade must not be fired with a cartridge with a bullet in it (ball cartridge), as this may burst the rifle.

5. The rod should be oiled, but only slightly, before placing it in the barrel.

6. The rod must be firmly screwed in.

Inspection.—In addition to the points noticed under No. 5 (Mills) grenade:

1. Only grenades with solid base plugs should be used for

rifle grenades, as otherwise the rod is liable to break the plug and cause a premature.

2. The hole in the base plug should be filled with wax or luting.

Packing.—The wooden box provided contains 12 grenades, 12 grenades, 12 igniter sets, 12 rods, and 12 cartridges.

HALES RIFLE GRENADE (VANELESS IMPROVED), No. 24, MARK I.

Description.—This grenade is a modified form of No. 20, from which it differs in the following particulars:

(*a*) The exterior of the body is serrated in horizontal rings only; there are no longitudinal serrations.

(*b*) The releasing socket is 1 inch long, instead of 1¾ inches, and the brass base is correspondingly shorter. The lower end of the brass base is not belled, so that the socket drops off about 10 yards from the rifle.

(*c*) The detonator container is 2 inches long, instead of 2¾ inches, and its milled top is a sleeve, instead of turned out of the solid.

(*d*) The striker is one half inch shorter and the needle point is blunt.

(*e*) The tube up the center of the body is shortened so that only the end of the detonator container engages in it, whereas in No. 20 the tube comes right up to the top of the body.

The action and instructions are the same as for No. 20.

85—Pippin Grenade:

[Weight complete, 1 pound, 8 ounces.]

Description.—The bomb consists of a tin cylinder 3 inches in diameter and 5 inches long. In one end is soldered a detonator tube and a short length of copper wire for binding purposes. The cylinder is filled with red phosphorus.

The bomb when exploded produces a thick white smoke; the phosphorus thrown out causes burns, and may cause fires.

The detonator supplied is the ordinary No. 8, fitted with 9 seconds fuse and Brock lighter.

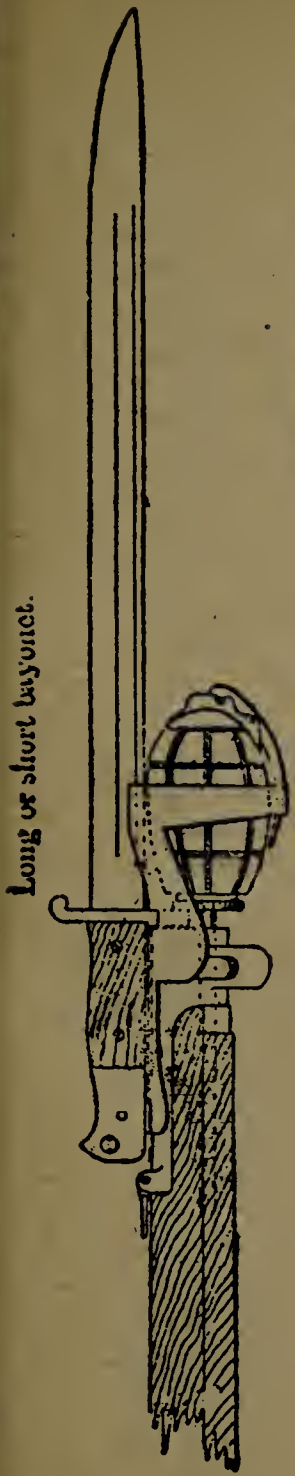
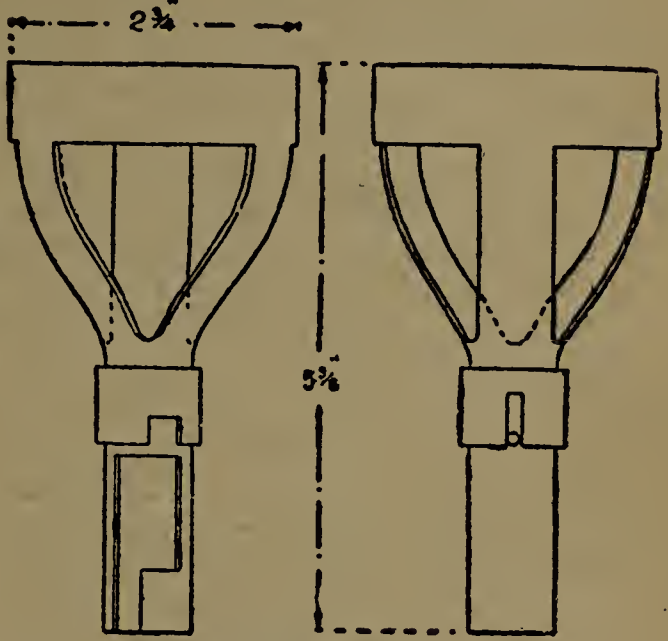


Fig. 59

No. 23 Grenade with a 5½" rod screwed into base plug.

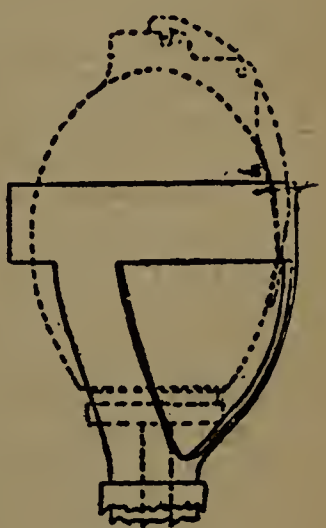
Attachment for Firing Mills Grenade from a Long Rifle.



Elevations.

Plan.

$\frac{1}{16}$" steel.



Elevation.

Fig. 60

INSTRUCTIONS.

To prepare for use: Insert the detonator in the detonator tube and bind in place with the copper wire.

To fire: Tear off the tape from Brock lighter and rub black blob of composition so exposed with the brassard supplied.

Precautions: Wherever stored, the grenades should be examined from time to time to see that the tins have not become corroded or rusted through into holes, as there is a danger of fire when the phosphorus is exposed to the atmosphere.

Packing: The grenades are packed 12 in a box, which also contains a tin of 12 detonators, fuses and fuse lighters, and two brassards.

PART 3.

86—British Bombing Operations, with Examples:

1. *Cooperation.*—Bombing attacks carried out without careful organization and cooperation of Lewis guns, rifle grenades, Stokes's mortars and snipers are likely to fail as a rule, and the most careful training at brigade and divisional bombing schools is necessary in order to insure best results.

Snipers and Lewis guns must be handled boldly. Pushed out in the open to a flank, they are likely to be of the greatest value in repelling counter attacks and assisting the advance of bombing parties.

Lewis guns were often most valuable as substitutes for bombing squads for blocking straight pieces of trench.

The Germans frequently make use of machine guns for this purpose.

2. *Stokes's Mortar shells.*—It has been found useful to provide bombers with Stokes's mortar shells, with one safety pin, and creep spring removed, thus turning the shell into a Mills's grenade on a large scale with a priming fuse up to 13 seconds. One of these shells is quite sufficient to severely damage entrances to dugouts, tunnels, etc.

3. *Mills's rifle grenades.*—These rifle grenades have been found especially useful in assisting the advance of bombers, their

range of 100 yards being of great value when the bombers are outraged by German "egg" grenades.

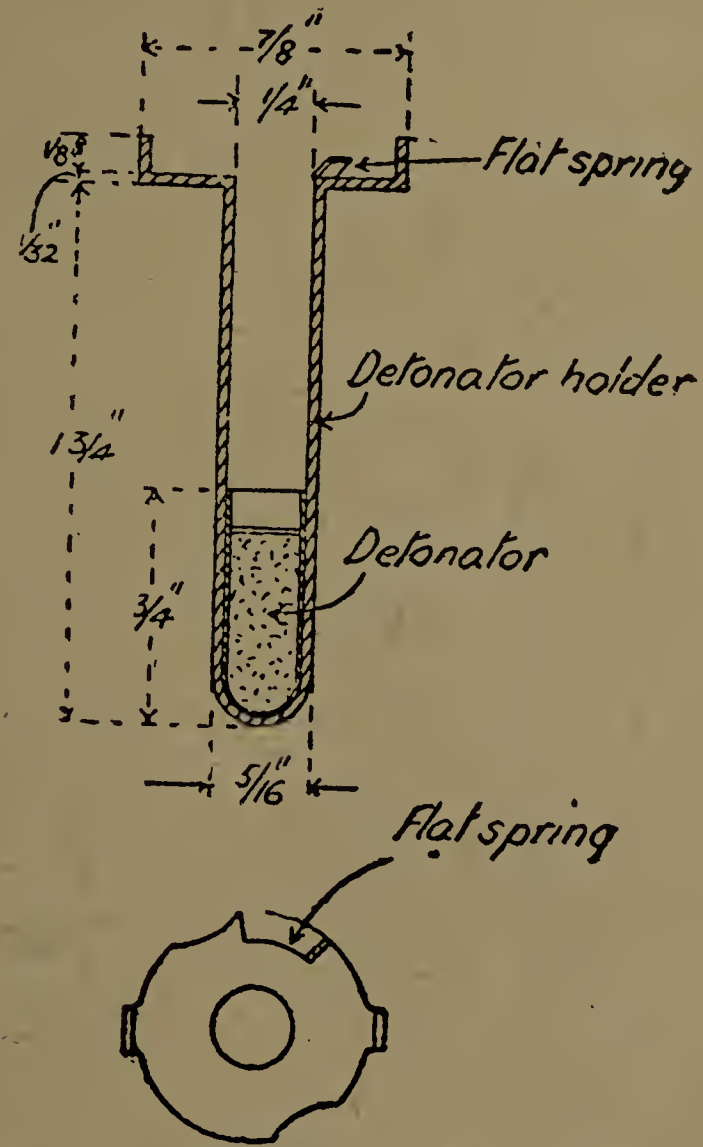


Fig. 61

An ample supply of rifle grenades is of the utmost importance, for they can frequently prevent hostile bombing parties from being organized for attack.

In order to facilitate the supply of Mills's rifle grenades, all Mills's grenades are now being tapped for rods.

4. *Supply of grenades.*—The proper organization of a plentiful supply of bombs is absolutely essential. Several advanced

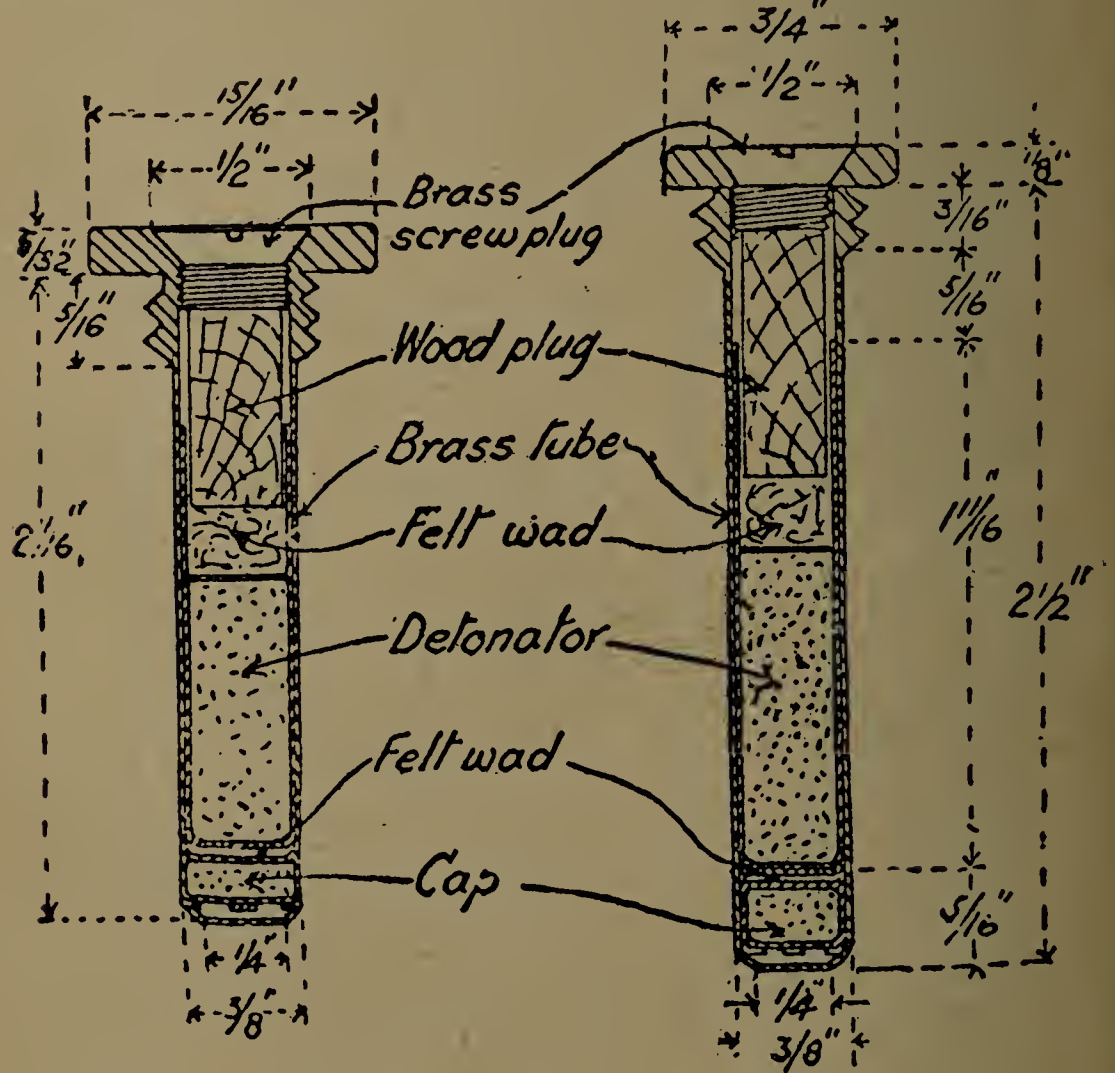


Fig. 62 Fig. 62

dumps, therefore, must be made when bombing operations are anticipated. The expenditure of bombs is extraordinarily large, and the replenishment of the advanced dumps is therefore a

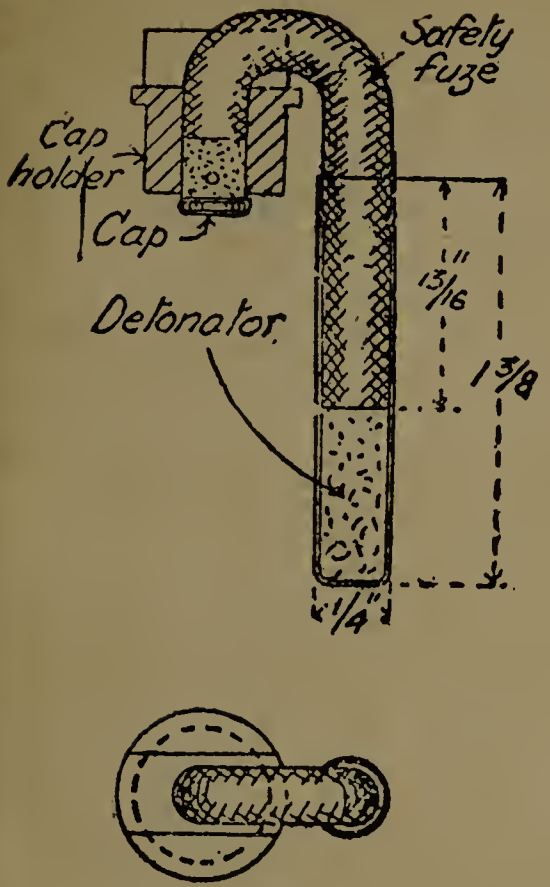


Fig. 63

No. 6 Detonator.

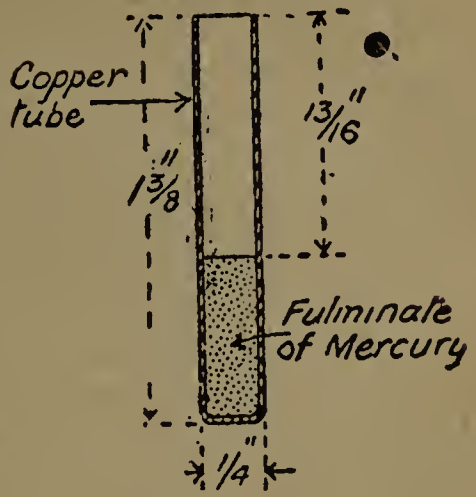


Fig. 8.

No. 8 Detonator.

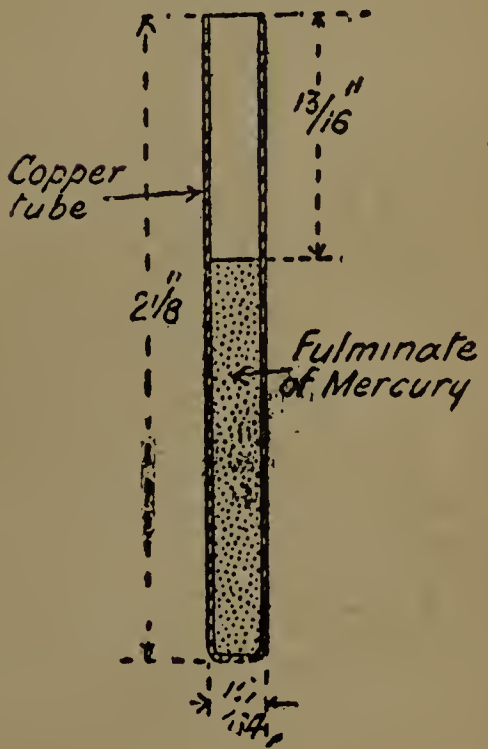
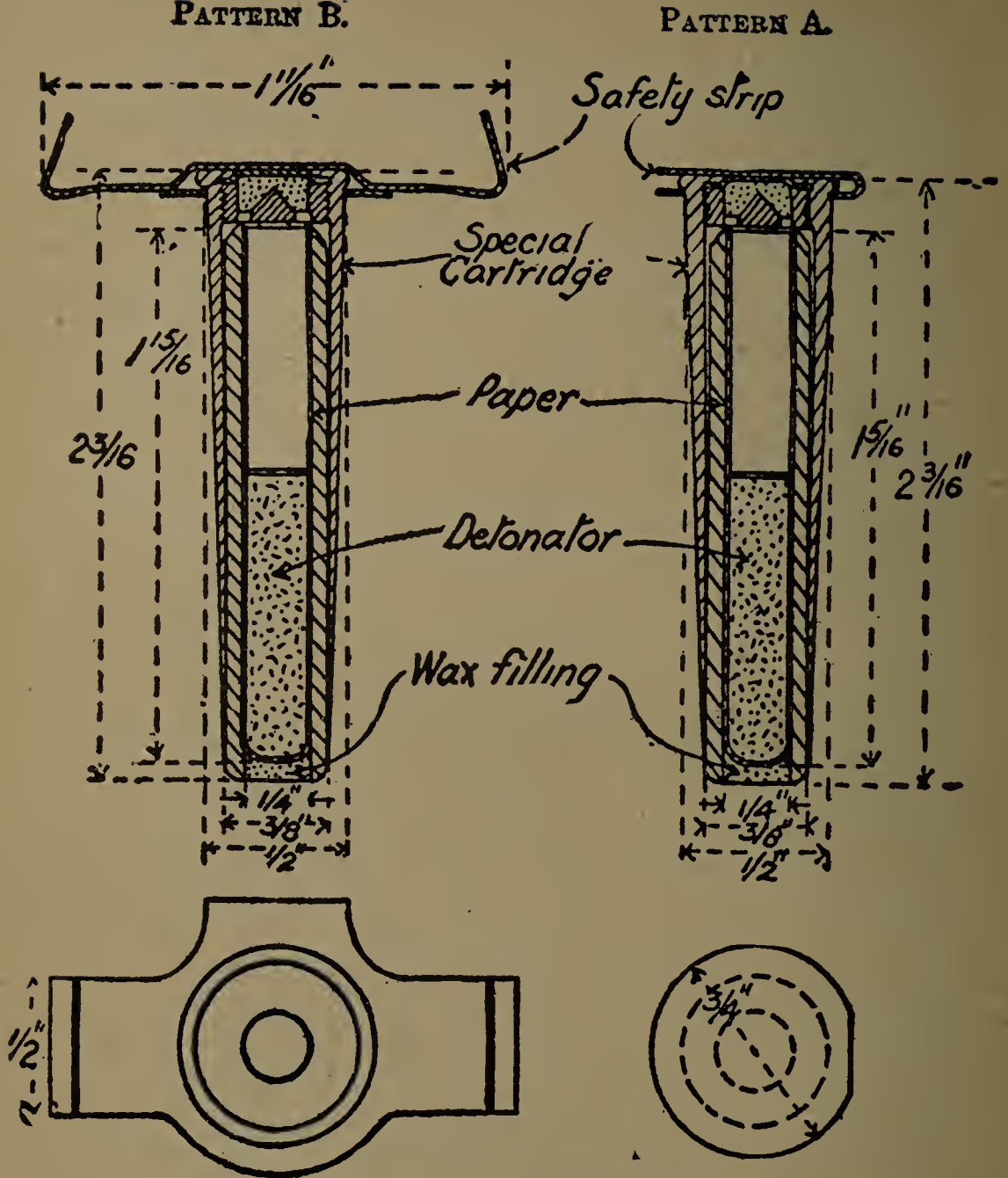


Fig. 64



FOR NO. 22 (PIPPIN RIFLE GRENADE).

Fig. 65 Fig. 66

matter of great difficulty. A permanent carrying party is essential. Troops in support, if recently relieved, are often too exhausted to perform this very arduous duty.

The use of a chain of men for passing grenades forward in sacks from hand to hand proved very successful. When this method could not be used, relays working within well-defined limits—that is, from dump to dump—also proved very satisfactory. In this case grenades were carried in boxes from brigade headquarters to the fire-trench dump and thence in sand bags, 12 in each bag.

Example I.—Attack by the A Battalion A. I. F. (Night of 29th-30th August).

(See fig. 67.)

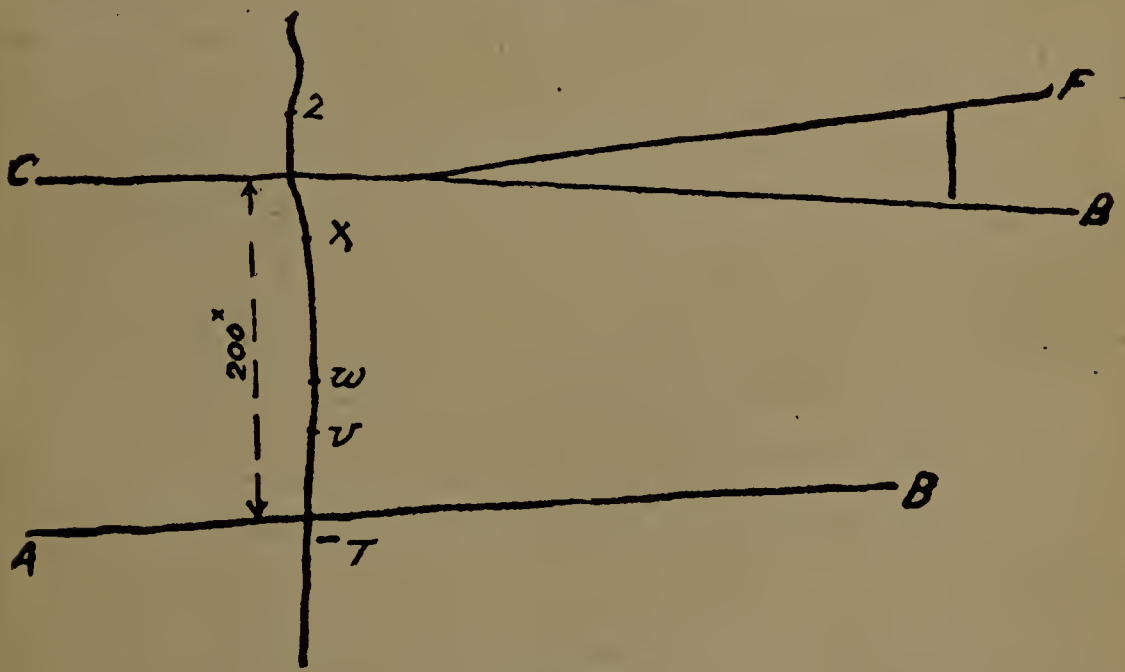


Fig. 67

1. Orders.—The line C D, C F was the objective for a company holding the line A B.

We had a block at V, the enemy having blocks at W and X in the same trench.

One section of the regimental bombing platoon was ordered

to work along the trench to the objective and to establish a block on the other side of it. A second section was ordered to follow in close support, and a Stokes mortar at T was ordered to co-operate. Company bombing sections were to follow the second wave of their company to deal with enemy dugouts and to clear up generally.

2. Narrative.—The first bombing section moved up to block V, and the second wave, moving out into No Man's Land, commenced bombing along the trench.

They passed the first enemy block (W) and were halfway to the second (X) when the assault was delivered by the first wave. From then to the first objective very little opposition was encountered.

On arriving at the intersection of trench V W X with trench C D they were assailed with bombs on their right and left from this latter trench, and also from Z, where enemy had established another block.

The trench mortar, being quickly informed, opened fire on Z.

The second bombing section was ordered to deal with the enemy's bombers on the right and left, while the first bombing section continued the advance under cover of the trench mortar, which increased its range about 15 yards every 3 shots.

Z was passed and a block established about 20 yards on the other side of it.

3. *Remarks.*—The total causualties of the two bombing sections were 6 wounded, whilst 10 of the enemy were found dead in the trench V W X Z.

The system of replacing casualties worked satisfactorily.

The bombers had no difficulty in following up the trench-mortar fire.

EXAMPLE II.—ATTACK BY —— BATTALION, WORCHESTER REGIMENT (24TH AUGUST).

1. This battalion, in conjunction with — Battalion, Wilts Regiment, carried out a successful attack on the Hindenburg trench. The right company was given special instructions to guard its right flank.

2. The objective was reached without much difficulty. Two squads of bombers, each consisting of 10 men, including two

Mill rifle bombers, were then ordered to hold point X, and, if possible, push on to Y, supported by a Lewis gun.

At point X party of six enemy bombers was encountered and driven back by two bombers after an encounter for a few seconds. Two bays behind them a party of 12 to 15 bombers was discovered; it stood its ground. It was evidently covering a machine-gun team, which was seen to be trying to mount a machine gun. This opposition was dealt with as follows:

(*a*) Riflemen were at once thrown out on either flank in shell holes, well out of bombing range.

(*b*) A Lewis gun was brought into action on top of a high traverse, enfilading the whole enemy trench, and immediately putting the enemy's gun out of action.

(*c*) A bombing squad attacked the enemy as follows: One officer with periscope (who also threw bombs), three bombers, each carrying 16 bombs, and a man with an artillery flag.

(*d*) A Stokes mortar fired on point Y throughout the operation.

After about 15 minutes' fighting the entire trench was captured and 23 prisoners taken. We suffered no casualties from the enemy's bombs.

3. The success of the operation was due to the following facts:

(*a*) The promptitude with which the Lewis gun and snipers got into position, thereby preventing the enemy from throwing his bombs to the best advantage, while our men outthrew him throughout.

(*b*) The composition of the bombing team prevented crowding, thereby obviating casualties and indiscriminate throwing.

The use of the periscope rendered the employment of bayonet men unnecessary and made it possible to observe each bomber's individual aim.

The artillery flag, though disclosing our position, was most necessary as a guide to the sniper, Lewis gun, and trench mortar battery.

(c) A few smoke bombs were carried, and two of the four dugouts found had to be burned out, as Germans were found coming out of them after the bombing party had passed and showed fight.

(*d*) The Stokes gun kept up an accurate fire on Point Y, and thereby probably prevented the retirement of the Germans who were captured.

No Mills rifle grenades were used, as our men successfully outthrew the enemy with hand grenades.

The battalion made a successful attack on a German strong point and bombed up the trench to the north of it.

The attack was made about midnight; during the day our artillery and Stokes mortars had shelled the strong point. This was V shaped, vide sketch.

Two platoons were directed to attack across the open (A on sketch), and bombing parties to bomb up the trench on either side (B and C on sketch,) and to join up with them.

Immediately before the assault the strong point was bombarded for a few minutes with rifle grenades. The enterprise was carefully timed, and each party reached its objective simultaneously and soon joined hands.

A considerable number of Germans were found in the deep dugouts and taken prisoners. Others ran up the trench (D on sketch), followed by our bombers, who killed several and took more prisoners; but finding they had pushed beyond their objective and that the enemy were rallying and trying to surround them they retired to the bomb stop which was being made at the prearranged objective.

As but little opposition was at first met with the bombing parties pushed on very quickly.

Branching off to the right and left were a large number of deep dugouts and trenches, and after finding "stops" over each dugout bombing teams for each branch trench and working parties to make barricades few men were left when the final objective was reached—where the most resistance was experienced. It was found more satisfactory to attack by daylight than by night, owing to the difficulty of seeing where the various dugouts and branch trenches led to.

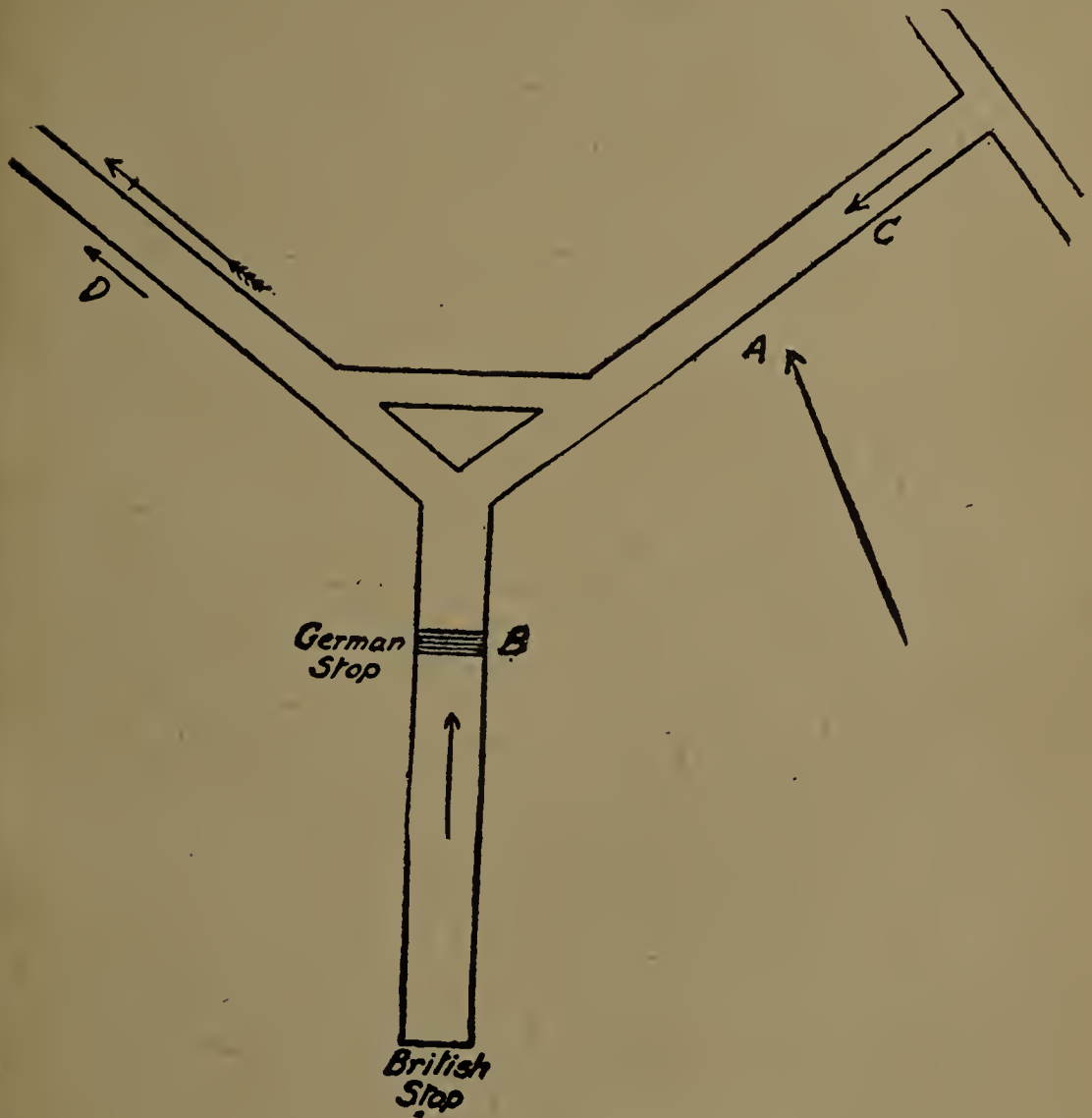


Fig. 68

CHAPTER IX.

DESCRIPTION OF GERMAN GRENADES

PART 1.

87—Description of German Grenades and Instructions for Their Use:

GENERAL REMARKS.

Descriptions of certain German grenades are given below. The first, third, and fourth are most commonly found, and are alone mentioned in documents recently captured. The last, the hair-brush (improvised hand grenade), was described in textbooks issued before the war.

1. Cylindrical hand grenade with handle (time fuse).
2. Cylindrical hand grenade with handle (percussion).
3. Egg hand grenade.
4. Rifle grenade, 1914.
5. Rifle grenade, 1913.
6. Disk hand grenade.
7. Spherical hand grenade.
8. Parachute grenade.
9. Small tin hand grenade.
10. Cylindrical hand grenade with spring igniter.
11. Hairbrush hand grenade with spring igniter.

German hand grenades which have been found are of two types: Those which have the appearance of service articles and those which are obviously improvised. With the latter, great care is invariably taken to protect the charge from damp, and to render it flashproof by waxing, etc.

The hand grenades are both time and percussion. With the former, the time of burning is about 6 seconds, and the fuse is ignited by one of the following methods:

1. Spring striker and cap. (See figs. 81, 82 and fig. 80.)
2. Friction tube. (See figs. 71, 74, 78 and 79.)

German Cylindrical Hand Grenade.
With handle (earlier type).

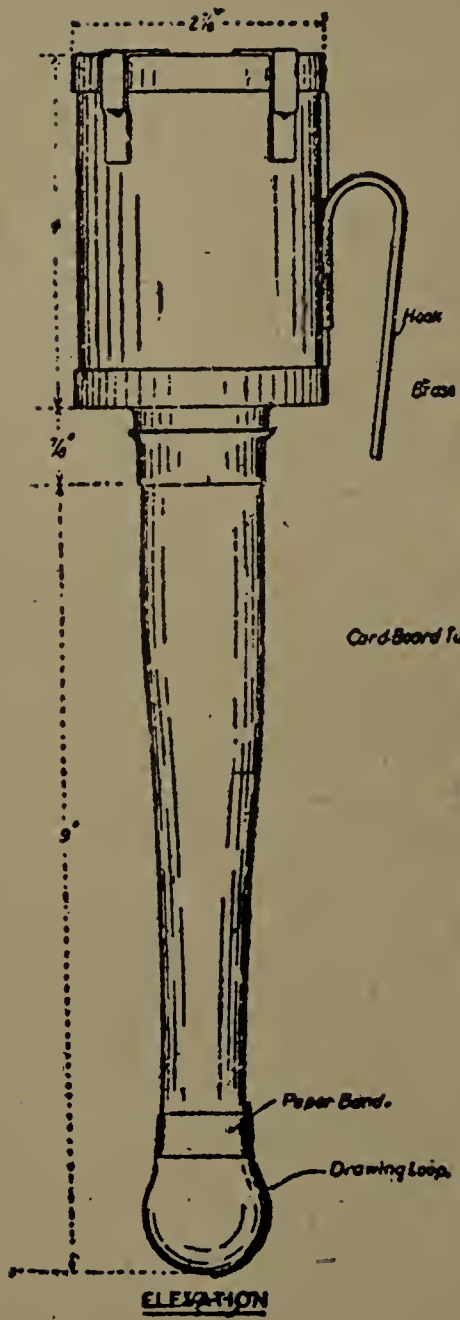


Fig. 69

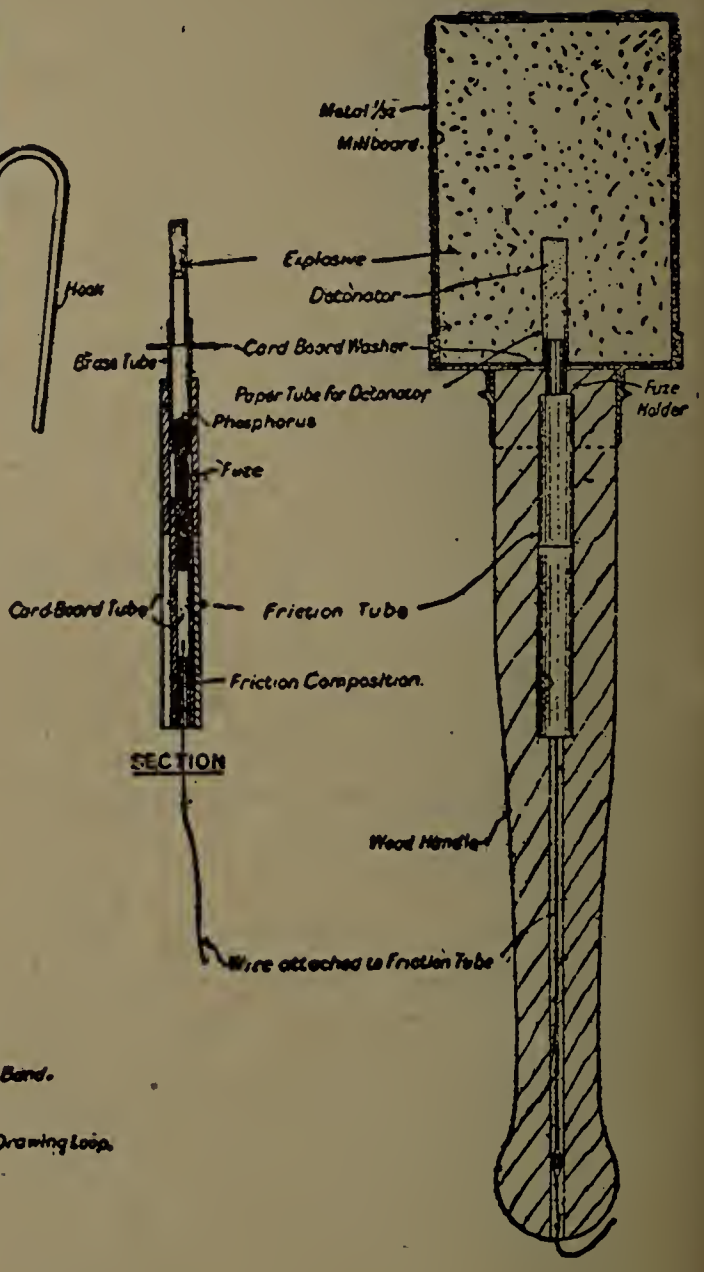


Fig. 70

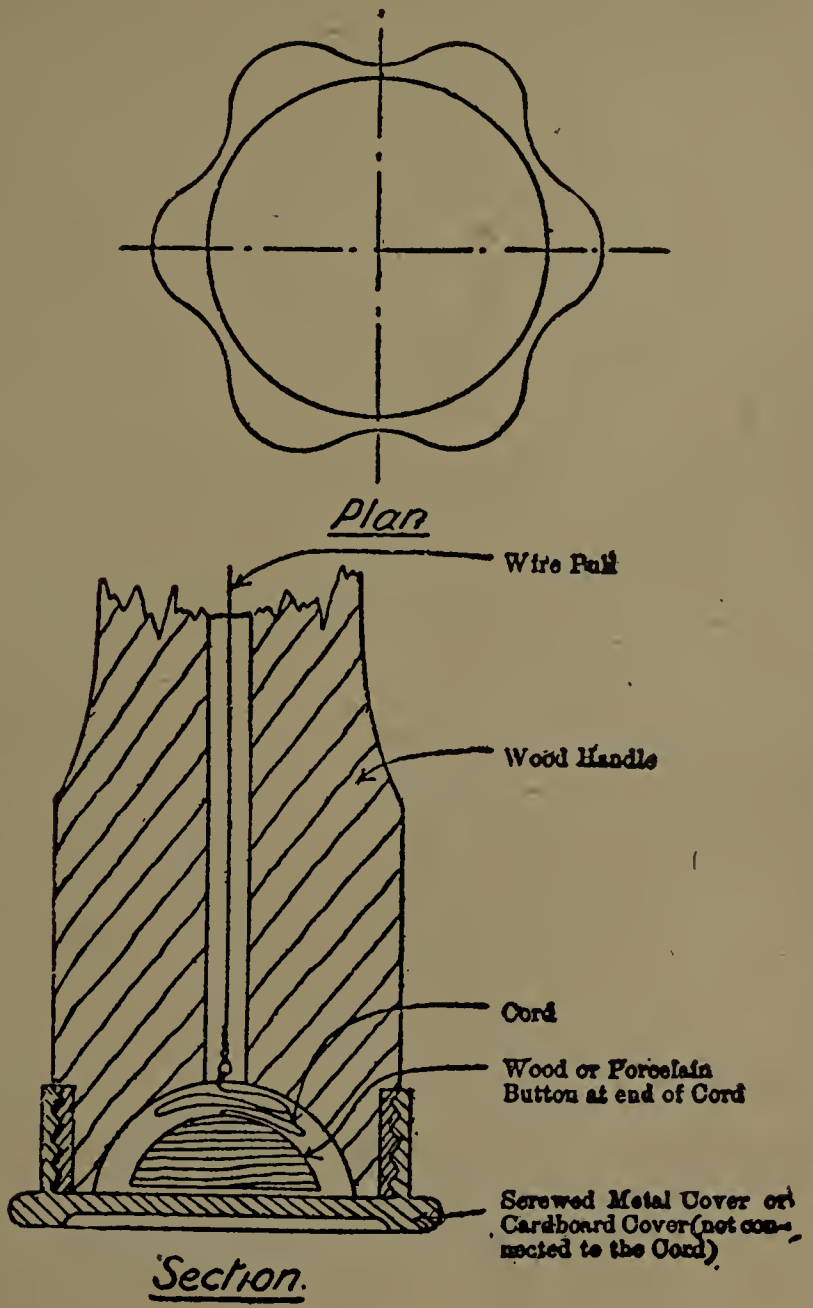

Plan
Wire Pull
Wood Handle
Cord
Wood or Porcelain Button at end of Cord
Screwed Metal Cover or Cardboard Cover (not connected to the Cord)
Section.

Fig. 71

3. Match-head lighter. (See fig. 83.)

Attached to fuse and detonator.

The following precautions should be taken with any grenades that may be found or captured:

1. The grenades should be examined at once by a bomber, in order to find out whether they are live, how they are fired, etc.

2. The means of firing will probably be immediately apparent to a trained bomber, but during examination grenades should be handled with care.

3. No man who does not understand grenades should touch them, but should report the presence of a store of grenades to the nearest bomber, N. C. O. or officer.

4. When used against the enemy, a grenade should be thrown as soon as it is "lit," even if there is no apparent evidence of the fuse burning.

5. Arrangement for removing, storing, or destroying grenades found in a captured position should be made as soon as possible by bombing officers.

6. Bombing officers will also be responsible that, when samples of grenades are taken back to headquarters for examination, the grenades are not in a dangerous condition, and the detonators have been removed.

PART 2.

STIELHANDGRANATE B.Z.*

[Weight, 1 pound 13 ounces.]

DESCRIPTION.

(See fig. 71.)

88—Cylindrical Hand Grenade with Handle and Time Fuse, Regulation Type:

Body.—Tin cylinder, 4 inches by 2⅞ inches diameter, containing a cartridge of explosive. The full charge is 300 gr. (10.5 oz.), but part of the space is sometimes filled by a wooden block.

* Generally known as the "jampot and stick" grenade.

The top is closed by a lid held in place by four clips; at the bottom there is a screw-threaded hole to take the handle. The bottom of the cartridge is fitted with a paper tube for the detonator. On the side of the body there is a hook, by means of which the grenade can be attached to the belt.

The inscription on the body, "Vor Gebrauch Sprengkapsel einsetzen" means "Before use insert the detonator."

Handle.—Wooden, about 9 inches long, with a metal top screwed to fit the body. It is bored axially to take the igniter and wire pull. In the latest pattern a screwed metal cap is fitted to the end, which protects the string loop attached to the wire pull.

Method of ignition.—The means of ignition consists of a friction lighter and safety fuse, contained in a cardboard tube. The igniter is actuated by pulling a string loop at the end of the handle. This loop is attached to the wire pull of the friction tube. In the old pattern the string loop is fixed to the handle by means of a proper band, but in the new pattern a porcelain button is attached to the loop in order to afford a better grip; a hallow is formed in the end of the handle and covered by means of a screwed metal or cardboard cover. When issued the string loop and button are coiled up in the hollow and are protected by the cover. The mouth of the detonator fits into a brass tube at the top of the igniter, and is fired by the flash from a dab of phosphorus at the end of the safety fuse. Time of burning, 5½ or 7 seconds, as marked on the handle.

Safety arrangements:

1. The grenade and detonator are kept separate during carriage.

2. The string loop is either attached to the handle by a paper band or contained in a metal or cardboard cover. The paper band or the cover should only be removed before firing.

INSTRUCTIONS.

To prepare for use:

1. Unscrew the handle and see of the detonator is in position; if it is, refix the handle.

2. Hold the grenade in the right hand.

3. Tear off the paper band with left hand or unscrew the metal cover, or remove cardboard cover, as the case may be.

4. Pull loop or button with left hand.

5. Throw immediately.

If the detonator is not in position, search should be made for a supply of the proper detonators. Fit the mouth of the detonator into the projecting brass tube, screw in the handle, and then proceed as in 2, 3, 4, and 5 above.

To render useless:

1. Unscrew handle, remove detonator.

2. Pull string loop, which will light the fuse, and throw handle away.

[Note.—The red grenade found in some boxes is a dummy without fuse, detonator, or exploder.]

89—Cylindrical Hand Grenade with Handle (Percussion), Regulation Type:

STIEL OR "WILHELM'S" HANDGRANATE, AZ.*

[Weight, 1 pound 12 ounces or 1 pound 5 ounces.]

DESCRIPTION.

(See figs. 72 and 73.)

This grenade is similar in general outward appearance to the "jampot and stick" grenade (time fuse), just described. The difference are:

1. The end of the handle (see below), which may have a wire loop projecting from it.

2. The diameter of the cylinder is 1 inch greater than that of the time-fuse pattern.

3. It has no hook on the side of the cylinder.

* Two official descriptions of this grenade were among the documents captured in August, 1916; but no specimen of it has been received at G. H. Q. The two descriptions vary slightly as regards the method of removing the safety pin and the amount of explosive.

GERMAN GRENADE.
CYLINDRICAL HAND GRENADE WITH HANDLE (PERCUSSION).
Half full size.

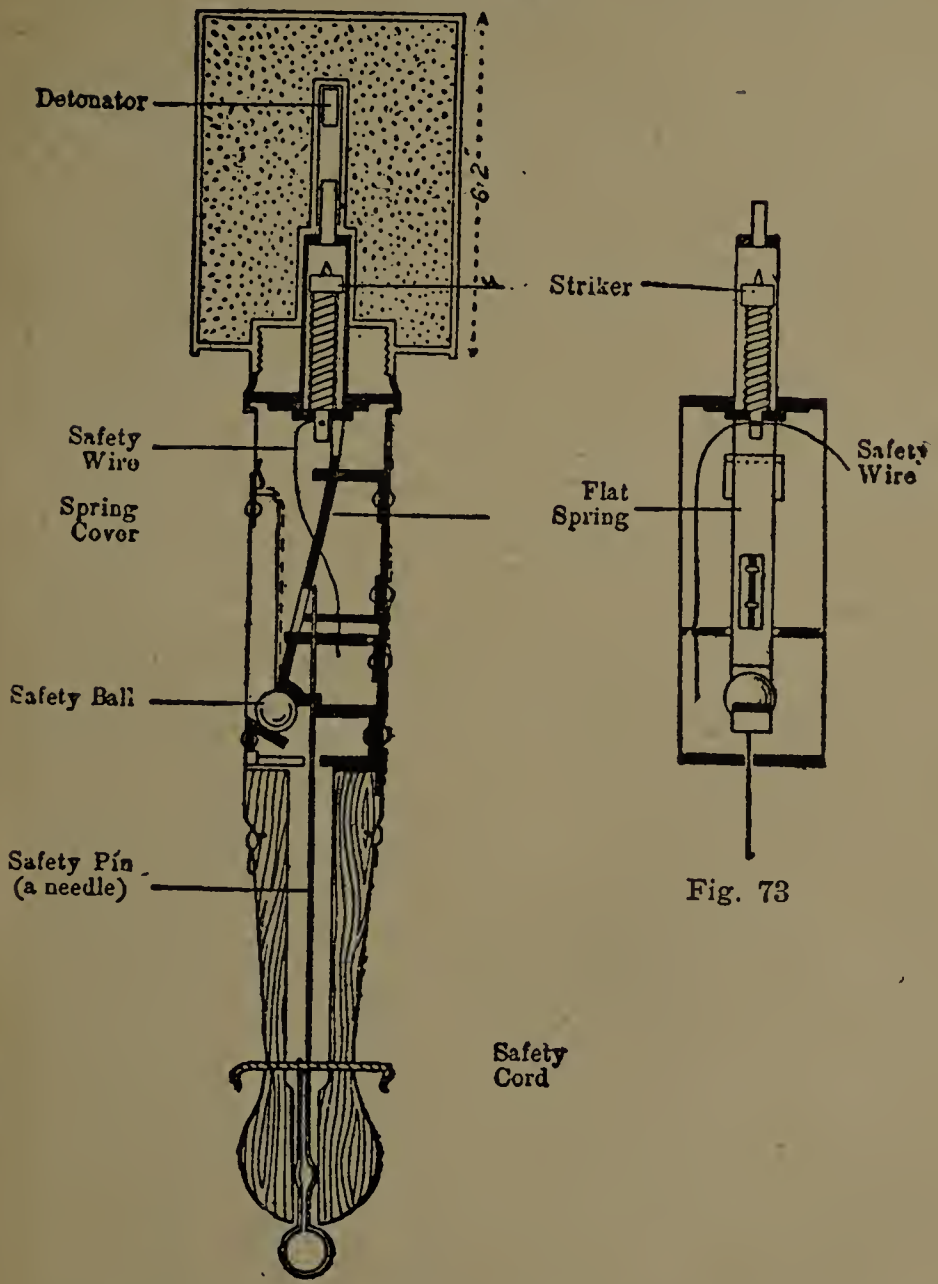


Fig. 73

In another description it is stated that the handle is covered by a cap. Under this is a weight which serves to pull out the safety pin when the grenade is thrown.

Fig. 72

Body.—Tin cylinder, 4 inches long (marked 6.2 inches in one drawing, though it only scales 4 inches) by 3⅞ inches in diameter. It contains a cartridge of 7 oz. according to one account, 15.8 oz. according to another, of explosive. The top is closed by a lid; at the bottom there is a screw-threaded hole to take the handle. The bottom of the cartridge is recessed and lined with cardboard to receive the detonator, etc.

Handle.—Partly metal and partly wood, about 9 inches long. The metal top contains the firing arrangements and is screwed to fit the body. The wooden part is bored axially to take the safety pin. In one description the loop of the wire safety pin projects from the end of the handle; in the other there is a weight attached to the end of the pin which is secured in a metal screw cap on the end of the handle.

Action.—This is not quite clear from the plate. It is described as follows: The firing arrangement consists of a striker and a safety device. On throwing, the safety pin is withdrawn by the weight flying out in one pattern, by hand in the other; the spring cover then flies off and withdraws the safety wire from the striker bolt, which is then only held by the ball and the flat spring. On striking the ground, the ball and flat spring fall out from their seatings; the striker bolt is therefore free, and is driven by its spring on to the cap.

Safety arrangements:

1. The grenade and detonator are kept separate during carriage.
2. Safety pin and safety wire (as described under "Action").
3. Cord which holds safety pin (or cap which keeps the weight secured).

INSTRUCTIONS

To prepare for use:

1. Unscrew the handle and remove filling from detonator recess.
2. Insert detonator in its place and replace the handle.

To throw:

1. Remove the safety cord (or unscrew the cap on the end of the handle.

2. If there is a loop at the end of the safety pin (and no weight), place the little finger of the right hand in the loop.

3. Grasp the handle with right hand and throw. The arm must be raised high and as much force as possible used, even if the target is near; otherwise the grenade may not be armed.

To render useless:

If the safety pin has not been pulled out, unscrew handle and remove the detonator.

Care must be taken in throwing not to hit the grenade against anything or it may explode.

As long as the safety pin is in the handle, the grenade is safe to handle and it will not detonate if struck or allowed to fall.

Blinds are extremely dangerous to handle.

90—Egg Hand Grenade (Eierhandgranate):

[Weight, 11 ounces, but patterns vary slightly.]

Can be thrown about 50 yards.

DESCRIPTION.

(See fig. 74.)

Body.—Cast iron, egg-shaped, about 60 mm. (2.3 inches) long by 45 mm. (1.77 inches) diameter, with a screwed hole at one end to receive the igniter. It is filled with a special powder which does not require a detonator.

Method of ignition.—The igniter is a lead alloy tube which screws into the body and contains a fuse; on one end is fitted a metal cap, containing the friction, which is operated by pulling a wire loop either by hand or by a wrist strap.

Two igniters are supplied—No. 1, with 8 seconds fuse for grenades thrown by mechanical means; No. 2, with 5 seconds fuse for grenades thrown by hand.

Safety arrangements: The igniter is carried separate from the grenade; a small lead plug is screwed into the body and must be removed before the igniter can be inserted.

INSTRUCTIONS.

To prepare for use:
1. Unscrew and remove lead plug.
2. Screw in igniter.

GERMAN EGG HAND GRENADE.

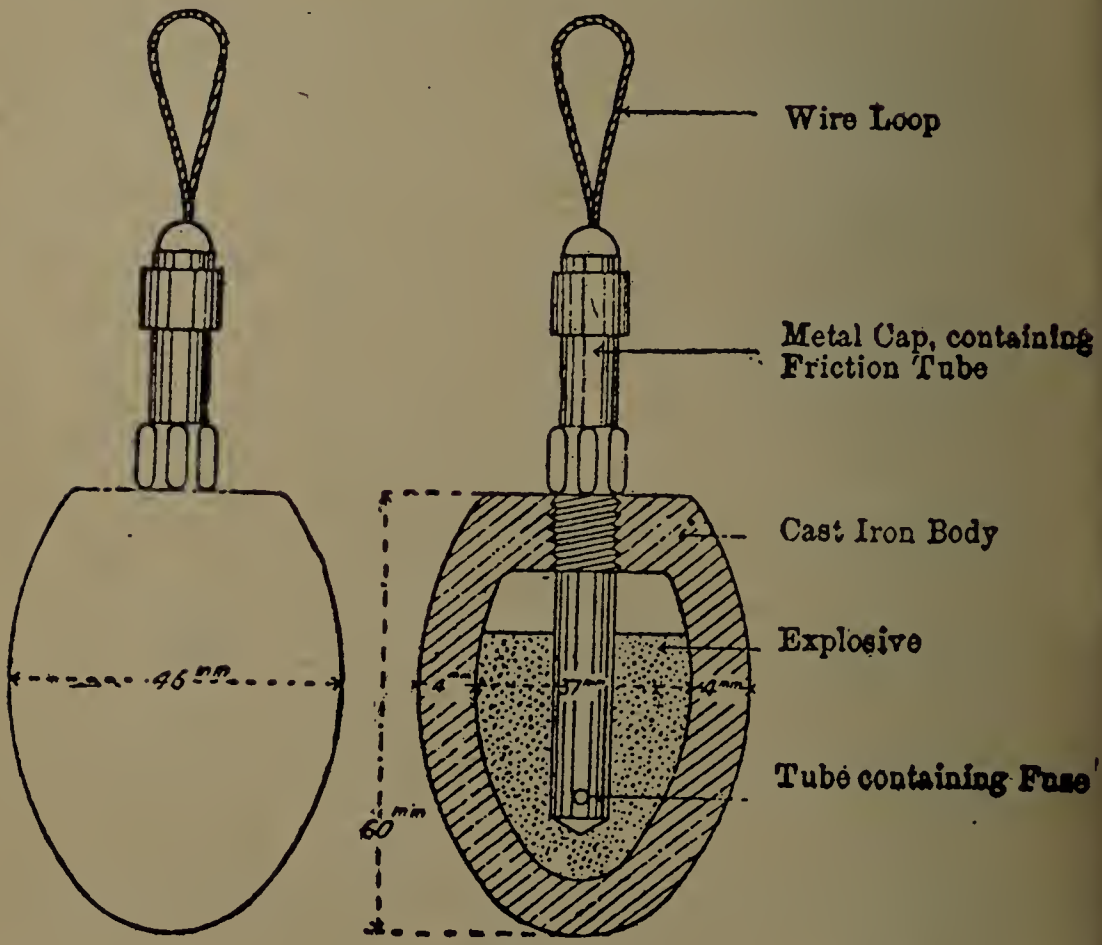


Fig. 74

It is important when screwing in the igniter to keep the grenade upright, so that no powder can get into the screw threads.

To throw: Pull the wire loop either by hand or by a wrist strap and throw in the usual way.

To render useless: Unscrew the igniter.

)1—Rifle Grenade, 1914. Percussion (Gewehrgranate):

[Weight about 2 pounds; maximum mean range, 380 yards.]

DESCRIPTION.

(See fig. 75.)

Body.—Cast iron, 0.2 inch thick, painted field gray and serrated o give fragments of sufficient size on detonation. The charge (2¾ ounces) is made up in a thin cardboard cylinder, which is ·etained in the grenade by a shoulder piece screwing on to the)ody. The nose of the grenade is screw-threaded to take the)ercussion fuse. and the base to take a nipple for a tin disk ınd tail rod with gas check. Until the fuse is inserted the nose s protected from dust and damp by a plug and leather washer.

Method of ignition.—The percussion fuse contains an exploding :harge with detonater and cap. The last-named is set off by a striker pellet screwed into the socket of the fuse. The needle of he pellet is hinged and lies flat on top of the cap when in the safety position, but is pulled and maintained erect by the spring n the striker pellet as soon as the pellet moves forward after iring.

Safety arrangements:

1. The striker pellet is retained in position by a locking ball, which rests in a recess in the pellet. This ball is prevented from falling out by a locking ring which is held up by a flat spring with curved ends. On the rifle being fired the locking ring overcomes the spring and sets back, and the locking ball is driven out of its recess by the striker pellet, which, acting under the pressure of its spring, moves forward out of the body together with the nose of the fuse. At the same time the needle pellet spring pulls up from being driven back onto the cap until impact.

INSTRUCTIONS.

To use:

1. Unscrew plug by means of the key, pull the two-pronged safety pin from the fuse, and screw the fuse in slowly and carefully by means of the key.

2. Lower the grenade carefully into the barrel.

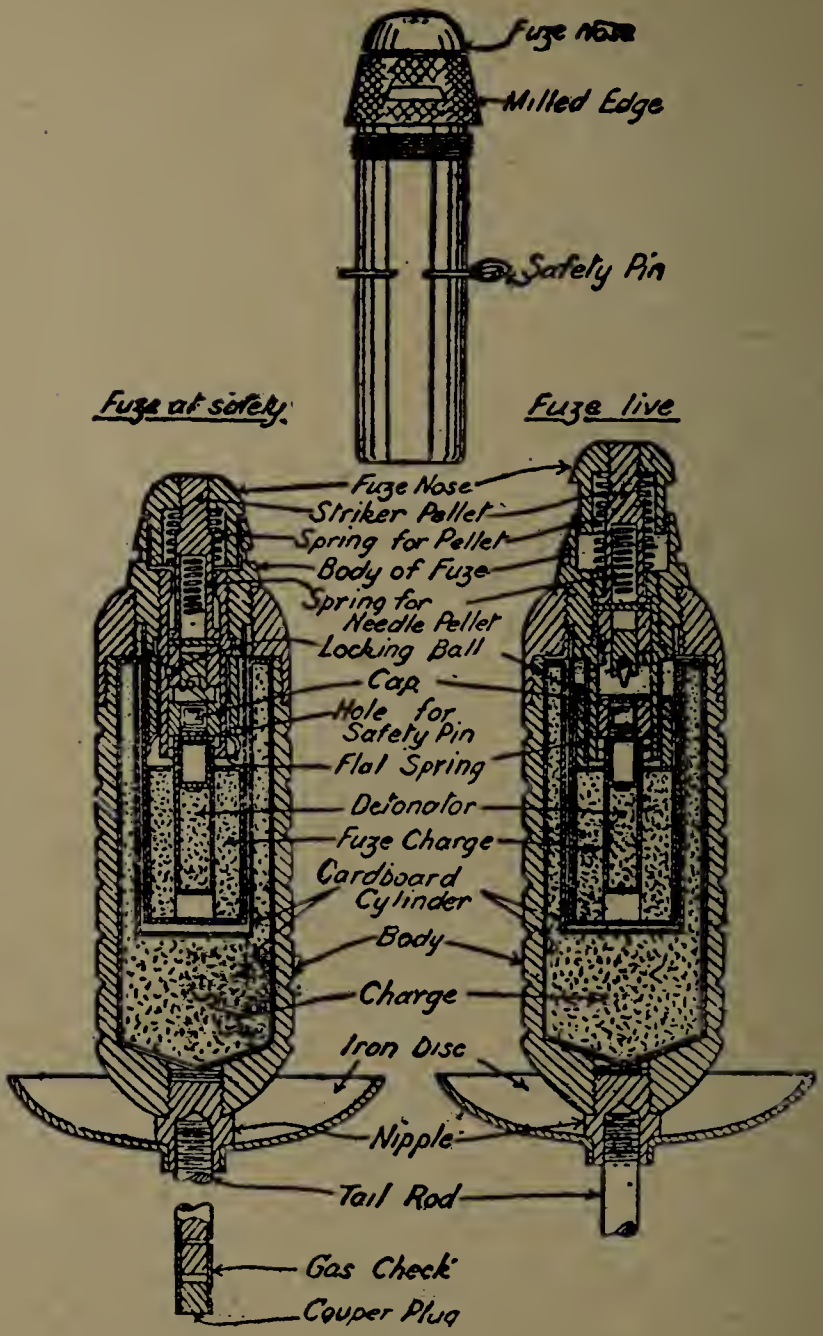

Fuze Nose
Milled Edge
Safety Pin
Fuze at safety
Fuze live
Fuze Nose
Striker Pellet
Spring for Pellet
Body of Fuze
Spring for Needle Pellet
Locking Ball
Cap
Hole for Safety Pin
Flat Spring
Detonator
Fuze Charge
Cardboard Cylinder
Body
Charge
Iron Disc
Nipple
Tail Rod
Gas Check
Couper Plug

Fig. 75

3. Insert special cartridge in the breech.

4. Fix the rifle at the required elevation.

5. Fire the rifle.

To render useless: Unscrew fuse from the grenade.

Precautions:

1. A German rifle, 98 or 88.05 only can be used.

2. Care must be taken that the grenade is not dropped, especially on the tail rod, as then it is liable to become "live," and will therefore detonate on firing. It should be carried head uppermost by the grenade, not by the rod.

3. The special rifle grenade cartridge must be used, and in no case a ball cartridge.

4. Tail rods which jam or rub when being placed in the barrel must not be used, and no force is to be employed.

5. Damp tail rods should be dried before use. All rods should be firmly screwed in.

Warning: Grenades with live fuses should not be fired or touched: They are easily recognizable, as the nose of the fuse will be found sticking out (compare *a* and *b*, fig. 75). Grenades in this condition should be destroyed as soon as possible.

92—Rifle Grenade, 1913 (Percussion):

[Weight, about 2 pounds complete; charge, 3.2 ounces explosive. Maximum mean range, 350 yards.]

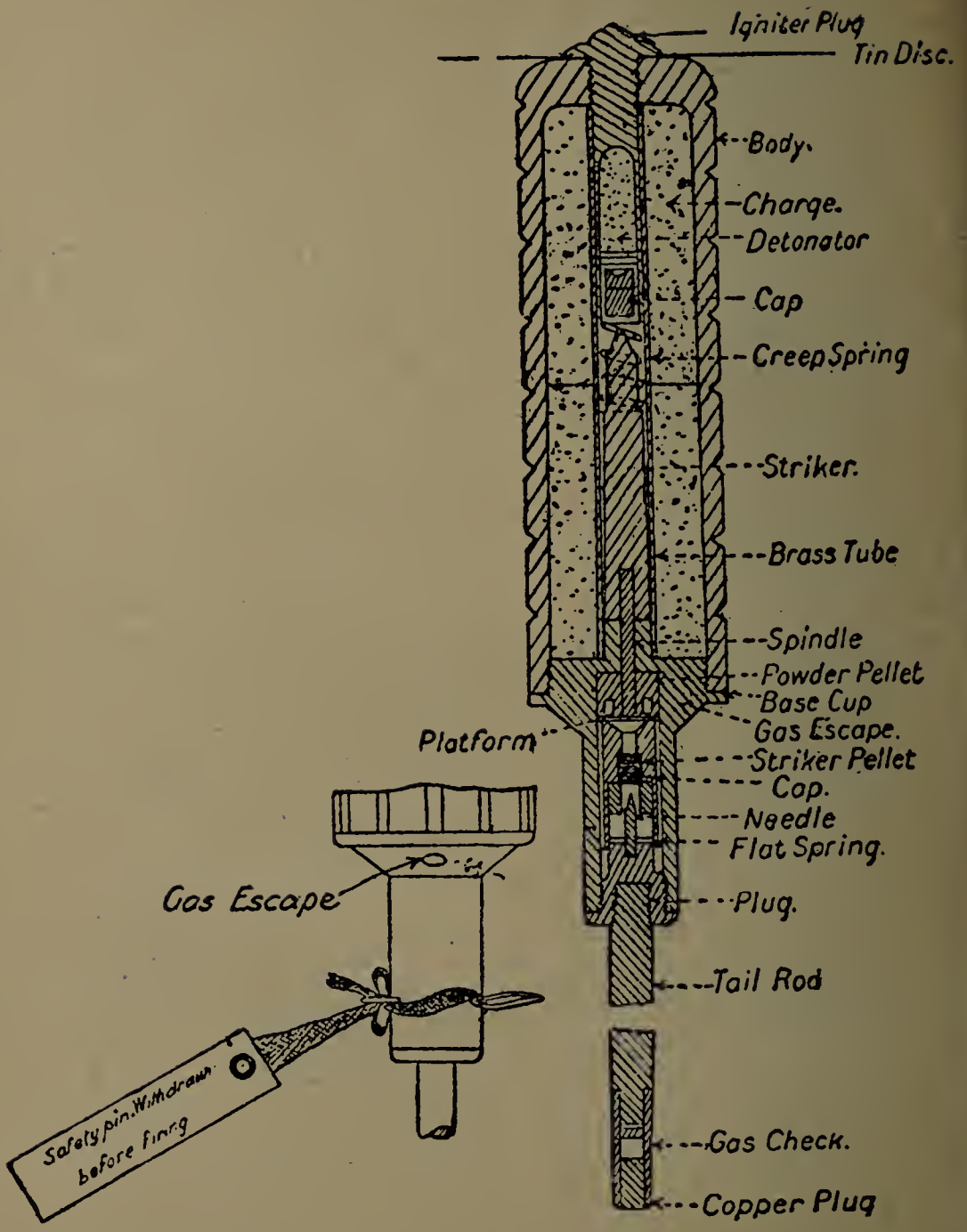
DESCRIPTION.

(See fig. 76.)

Body.—Steel, 4.3 inches long and 0.16 inch thick, is serrated longitudinally and traversely, so that on detonation it may split up into fragments of sufficient size. It is painted gray. The base is closed by a brass base cup, which has screwed into it a steel tail rod 18 inches long, with copper gas check to take the grooves of the rifling. The rod has a thin coating of copper to protect it from rust and also to protect the barrel. A tin disk is fastened to the head of grenade by the igniter plug for short ranges.

Method of ignition.—An igniter plug, carrying cap and detonator, screwed into the head of the grenade. A brass tube

Rifle Grenade, 1913.



To show safety pin in latest pattern.

Fig. 76

passing through the center of the grenade contains a striker pellet, with needle and creep spring.

Safety arrangements:

1. A powder safety device is contained in base cup. Screwed into the striker pellet is a spindle which passes through into the base cup and has at its lower end a small platform with three flash holes. On this rests a pellet of compressed powder, the object of which is to keep the striker from moving forward until a short time after the grenade has left the rifle. This powder is ignited by means of a small brass pellet with a cap, which sets back on the shock of discharge, and, flattening a small spring, is penetrated by a needle on the screw plug closing the base cup. A vent hole in the base cup allows the escape of the gases of combustion. This is normally sealed with wax.

2. When the powder is burned away the striker is only prevented from moving forward by a creep spring, the resistance of which is overcome on strike.

INSTRUCTIONS.

To use:

1. Unscrew zinc plug from the head.
2. Screw in the igniter plug (with tin disk for ranges under 200 yards).
3. Lower the grenade carefully into the barrel.
4. Insert a rifle grenade cartridge in the breech.
5. Fix the rifle at the required elevation.
6. Fire the rifle.

To render useless: Unscrew the igniter plug in the head of the grenade, holding the grenade with the rod downward.

Precautions:

1. A German rifle 98 or 88.05 only can be used.
2. Care must be taken that the grenade is not dropped, especially on the tail rod, as then it is liable to become "live," and will therefore detonate on firing. It should be carried head uppermost by the grenade, not by the rod.

3. The special rifle grenade cartridge must be used, and in no case a ball cartridge.

4. Tail rods which jam or rub when being placed in the barrel must not be used, and no force is to be employed.

5. Damp tail rods should be dried before us. All rods should be firmly screwed in.

[NOTE.—In a document captured September, 1916, an improved pattern of the 1913 rifle grenade is described. It is provided with a two-pronged safety pin like the 1914 pattern, but inserted in the brass base in order to hold the striker pellet from moving. This safety pin must be removed before firing. See Plate L.]

The following warning is also given: "After taking the grenade from the box it should be examined to see that the gas escape hole is closed and has not been blackened by the burning of the powder pellet. Grenades in which this has happened are dangerous and must not be used."

93—Disk Hand Grenade. Percussion. (Diskus-Handgranate, 1915):

There are two patterns, one weighing 15 ounces and the other slightly smaller, 13¼ ounces. The former is made of sheet metal and is for throwing in the open; the latter is of cast iron and should only be thrown from behind cover.

DESCRIPTION.

(See fig. 77.)

Body.—Two iron shells, convex on the ouside and with the edges either turned over or riveted. It contains two circular bags of explosive, each containing 2 ounces.

Method of ignition.—Consists of six metal tubes in the shape of a star, meeting at the center of the grenade plug. Four of these tubes carry striker pellets with caps at the inner ends, and opposite to each cap is one of the points of a four-pointed star. The outer end of each of these tubes is closed by a screwed plug. One of the remaining two tubes carries the detonator, of which the inner end is open. This tube is closed by a screwed plug with milled head with the letter "S" on it.

Safety arrangement.—The sixth tube contains a safety pellet divided into two prongs, one of which passes on each side of the star and protects the points. This pellet is retained in its position by a cap which closes the outer end of this tube. The cap is secured to the tube either by clips or by a safety pin with ring.

Action during flight.—Owing to the grenade turning over, the safety pellet flies out and the grenade becomes sensitive. When the edge of the grenade strikes the target the corresponding striker pellet drives the cap forward on to the point of the star. The flash passes into the detonator and explodes the charge. A low or horizontal throw may cause a failure. On detonation the fragments fly out laterally, and not to the front or rear.

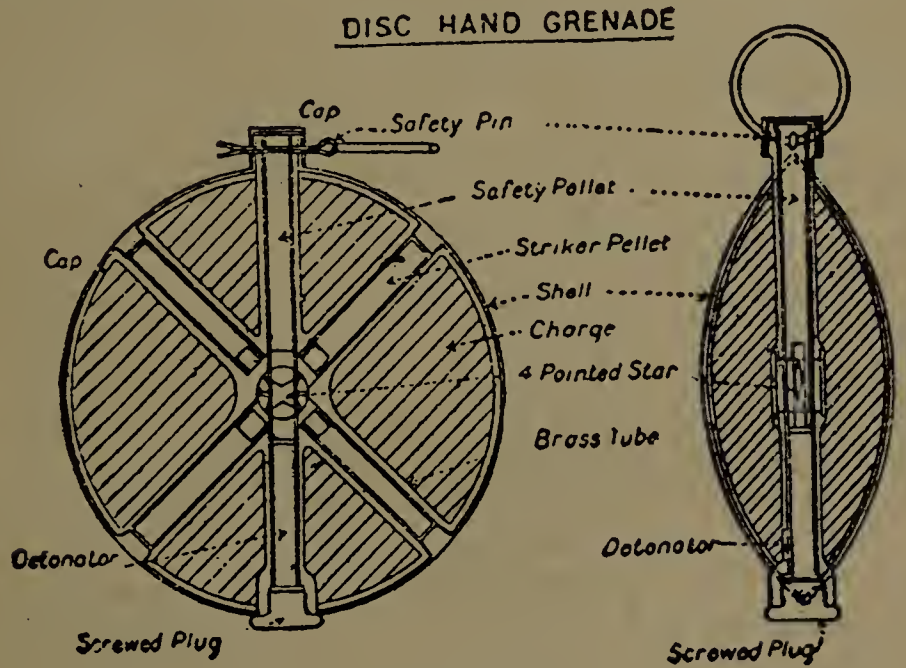


Fig. 77

INSTRUCTIONS.

To prepare for use:

1. Hold the grenade in the right hand, safety pin upwards.
2. Pull out the safety pin with the left hand.

3. Pull off the cap and hold the safety pellet in position with the right forefinger. (If necessary, the safety pin can be replaced.)

4. Throw the grenade as high as possible, taking care that the edge is vertical.

These grenades can also be thrown with the strap provided in each box, but this method requires considerable practice.

To render useless:

1. Unscrew the plug of the tube, marked "S," opposite to the safety pin.

2. Remove detonator.

Warning:

Blinds are dangerous. As soon as any part of the safety pellet projects there is chance of detonation.

[NOTE.—The red grenade to be found in every box is a dummy for practice.]

94—Spherical Hand Grenade:

[Weight, 1 pound 10 ounces.]

Can be thrown about 30 yards.

DESCRIPTION.

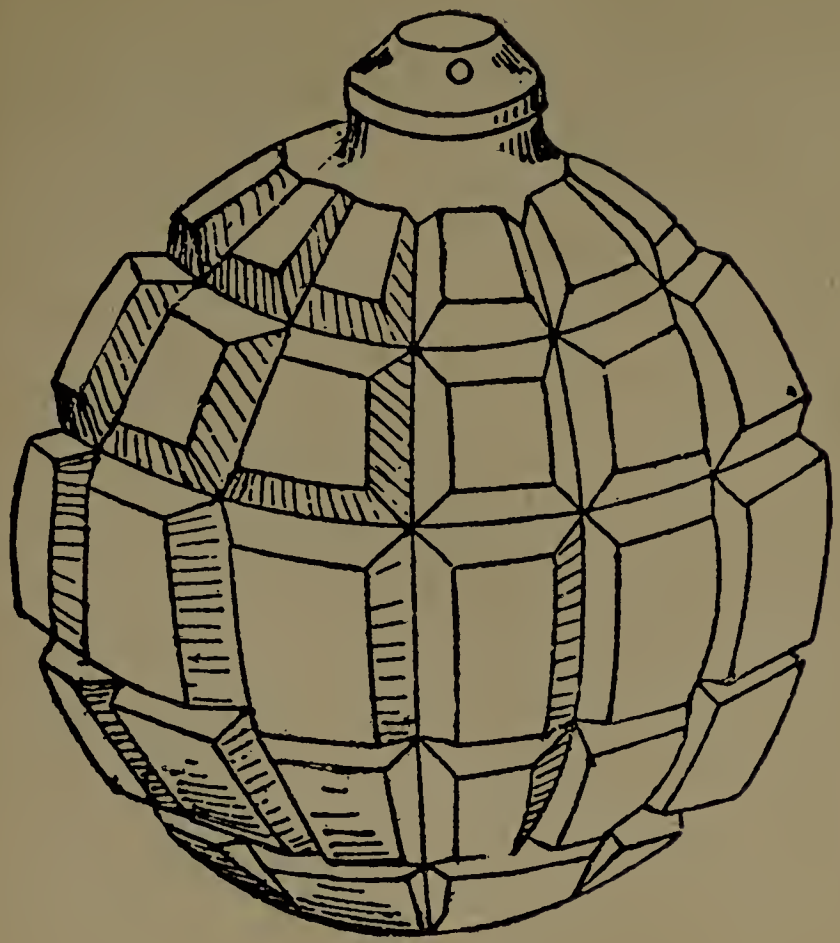
(See fig. 78 and 79.)

Body.—Spherical, about 3 inches in diameter, made of cast iron about one-third inch thick, and is filled with black powder or other explosive which does not require a detonator. The body is coated with varnish inside and out.

Method of ignition.—Combination of friction tube, lighter, and fuse. The friction tube is fired by pulling out the wire in the direction of the axis of the tube. (See B.) A wrist strap with a swivel hook is usually provided for this purpose. Time of burning, seven seconds. A similar lighter which burns for five seconds is also provided. It is distinguishable by the head of the fuse being painted red.

Safety arrangements:

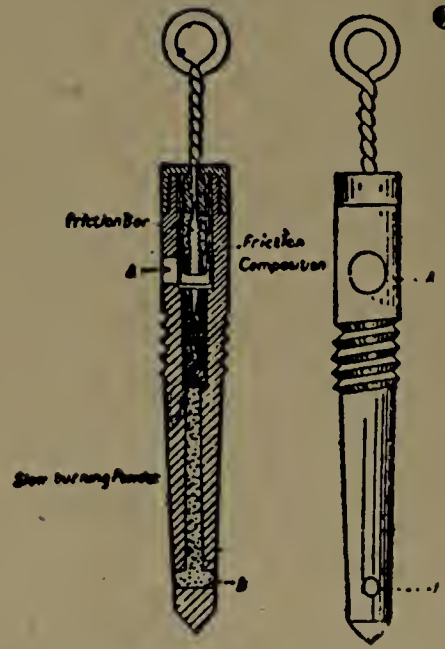
1. Grenade and fuse kept separate during carriage.



Scale ⅔.

Fig. 78

German Spherical Hand Grenade.



Section. Elevation.

Friction lighter.

Fig. 79

2. The vent for the fuse in the grenade is closed by means of a zinc plug.

3. The holes A and B (See B) in the lighter are covered with waterproof paper.

4. The wire is bent in order to prevent a direct pull.

INSTRUCTIONS

To prepare for use:

1. Take the lighter, remove the oiled paper from A and B and straighten the wire, taking care not to pull it.

2. Insert the lighter.

To throw:

1. Put on the wrist strap.

2. Hold the grenade in the right hand, with the igniter toward the wrist.

3. Hook the swivel at the end of the strap onto the wire pull of the grenade.

4. Throw the grenade.

If a strap is not provided, a nail or a loop of string should be passed through the wire pull.

To render useless:

1. Bend the wire down if it is straightened, taking care not to pull it.

2. Unscrew the lighter.

3. Sake out the contents of the grenade.

PARACHUTE GRENADE (PERCUSSION).

DESCRIPTION.

(See fig. 80.)

Body.—Painted black, consists of a tin cylinder of explosive with hemispherical head of larger diameter containing shrapnel bullets. A buffer cylinder passes through the body and projects, so as to produce the explosion slightly above the ground. The base of the body is closed by a wooden plug at the handle. A parachute safety arrangement is attached to the head of the handle in order to prevent fragments flying to the rear on explosion, and also to cause the grenade to fall on its head.

Method of ignition.—1. The detonator in the buffer cylinder supported by the screwed plug at the end. 2. The striker pellet with point and spiral spring.

Safety arrangements:

1. A cord 7 meters long, which normally is coiled up inside the handle, is attached to a long needle passing down the percussion pellet. A safety hook retains a ring attached to the end of the strike pellet and the needle passes through a hole in this hook. After the first 7 meters of the flight, the jerk on the cord pulls out the needle, and the safety hook is thus free to fall out sideways and so allow the percussion pellet to move forward on concussion.

2. Keep pin and creep spring. The former prevents the percussion pellet from falling back.

INSTRUCTIONS.

To prepare for use:

1. Unscrew the plug in head.

2. Place in the detonator, fulminate downwards.

3. Screw in the plug.

To throw:

1. Tear off the band holding the parachute.

2. Holding the loop of the cord firmly with the first and second fingers of the right hand, take out the plug from the handle, unwinding as short a length as possible of the cord.

3. Hold the grenade in the right hand.

4. Retain the loop of the cord, throw the grenade so that it will reach a height of 12 or 13 feet.

To render useless:

Unscrew the plug and remove the detonator.

The grenades may be found "live," in which case 1, 2, and 3 have already been done.

This grenade can be used in attack or defense, but it is particularly designed for the former, as the fragments are projected in a forward direction only, and so are not dangerous to the throwers. The safety arrangements prevent the grenade from becoming dangerous until it has flown about 7 meters.

Parachute Hand Grenade.

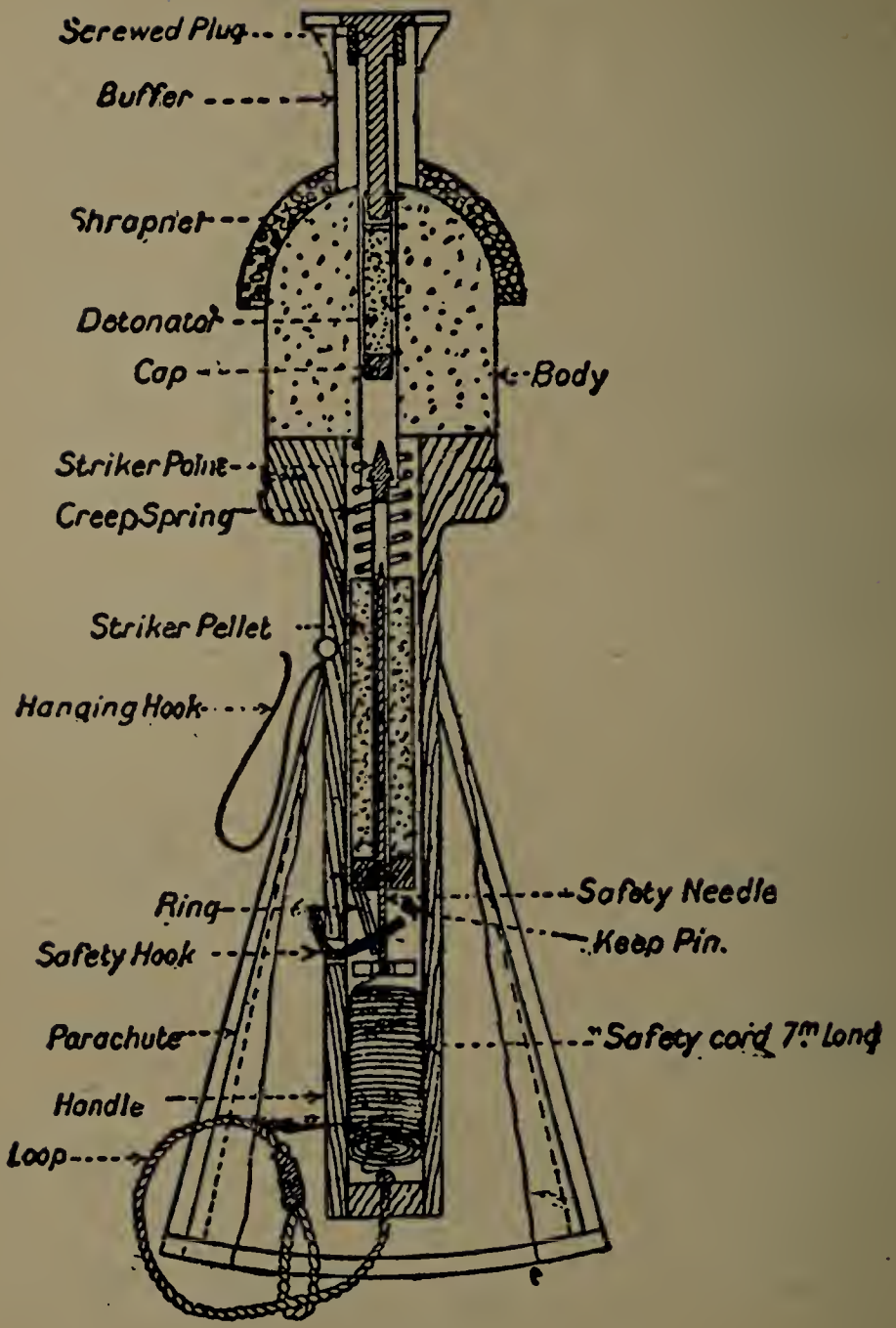


Fig. 80

95—Small Tin Hand Grenade:

[Weight, 12 ounces.]

DESCRIPTION.

(See fig. 83.)

INSTRUCTIONS.

Body.—Tin case, 4⅞ inches by 1 1/16 by 1 1/16, loaded with explosive.

Method of ignition.—Combined match-head igniter, fuse, and detonator (see fig. 83).

The match-head igniter consists of a small lead tube closed at one end with a ball of red phosphorus, varnished, and covered with oiled paper.

A piece of safety fuse is pushed home and secured in position by crimping the tube around it; the detonator is fixed to the other end of the fuse in a similar manner.

Safety arrangements:

1. The grenade and igniter are kept separate during carriage and a wooden plug is put into the grenade in place of the detonator.

2. The phosphorus head is protected from friction and damp by water-proof paper.

INSTRUCTIONS.

To prepare for use:

Take out the wooden plug (if necessary use the rectifier) and insert the igniter. The igniter is kept in place by the lead tube fitting tightly into its seating; the joint should be waxed.

Tear off the paper cover from the lighter.

Hold the grenade in the right hand, rub the match-head with some rough material (side of match-box, etc.); a wind-match or pocket-lighter may be used instead.

Throw immediately.

Time of burning, 6 seconds.

To render useless: Take out igniter and fill up hole with mud, etc.

96—Cylindrical Hand Grenade with Spring Igniter, Charged with Missiles, etc.:

[Weight, 2½ pounds.]

DESCRIPTION.

(See figs. 81 and 82.)

Body.—Cylindrical tin of explosive, 2 inches diameter, placed in a tin 3 inches diameter, the space between being filled with nails, scrap iron, etc. The bottom is closed by a wooden plug, in which a small hole is bored for the detonator. The handle is of wood, 8¾ inches long, the head of which forms the wooden base plug. To secure the body to the handle, the edge of the outer cylinder of the body is turned down over the base plug.

Method of ignition.—Consists of a spring, striker, and cap, incased in brass tube, fastened to the handle by a steel band. Fuse and detonator are attached in the usual way.

The spring is compressed by a collar at the end of the striker rod. The rod is held back by a safety pin passing through it at the end of the case. As soon as the pin is released, the striker flies forward and fires the cap, thus lighting the fuse.

This spring lighter is used in most of the German extemporized hand grenades, land mines, charges for destroying dugouts, etc.

Fuse, about 2 inches long. Time of burning, 6 seconds.

INSTRUCTIONS.

(*a*) To prepare for use:

1. Hold the grenade in the right hand.
2. Withdraw the safety pin.
3. Throw at once.

(*b*) To render useless:

1. Remove the handle and base plug by raising the turned-down edge of the cylinder. This must be done very carefully.
2. Empty the contents of the body.

German Cylindrical Hand Grenade

With spring igniter.

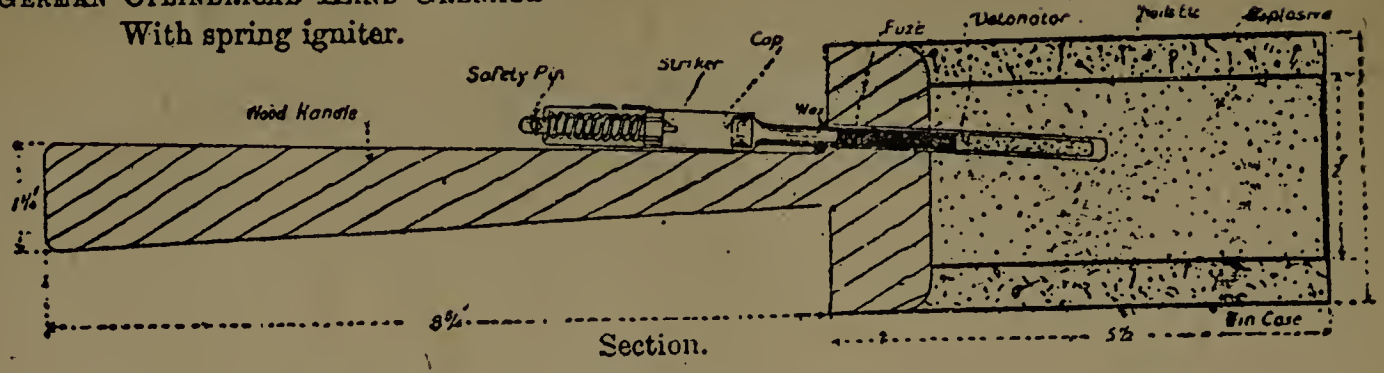


Fig. 81

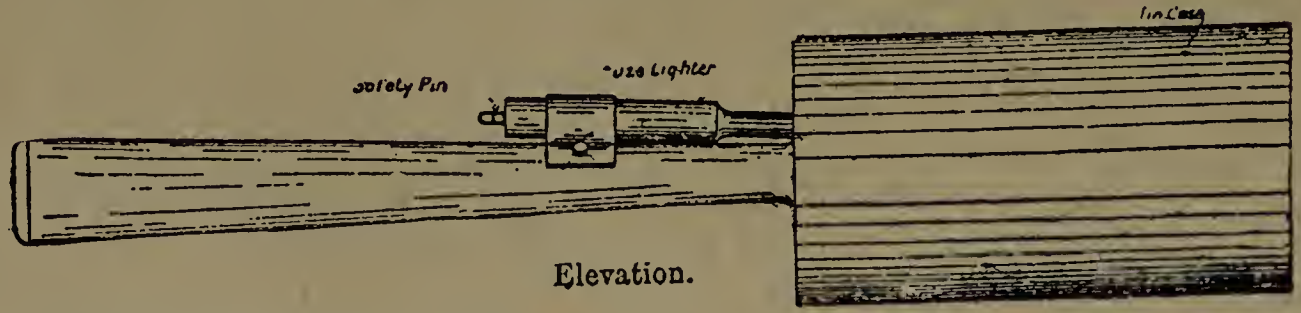


Fig. 82

German Small Tin Hand Grenade.

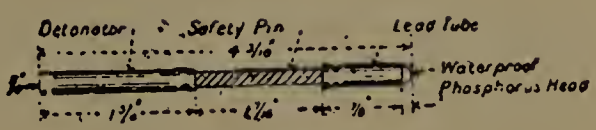
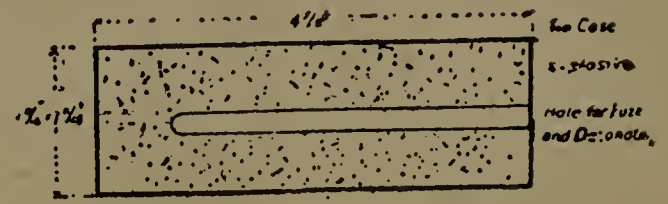


Fig. 83



97—Hairbrush Hand Grenade with Spring Igniter:
[Weight, 2½ pounds.]

DESCRIPTION.

(See figs. 81 and 82.)

Body.—Tin box, 2¾ inches by 2¾ inches by 6 inches, filled with explosive. This box is nailed onto a wooden handle. Length, complete, 15 inches.

Method of ignition.—Spring igniter, fuse, and detonator, similar to that used in the cylindrical grenade with spring igniter. The igniter is kept in position by means of a zinc band screwed onto the handle.

Safety arrangements and instructions.—As for cylindrical hand grenade with spring igniter see 9 above.

PART 3.

98—German Grenade Tactics:

[Translation of a German document.]

I. BOMBING PARTIES.

The bombing party (Handgranatentrupp) operates, as a unit, chiefly in the trench itself, its action being both offensive and defensive; the manner in which it should be stationed and distributed, employed, armed, led, and safeguarded must be regulated accordingly.

Men selected for this work should be courageous and expert hand-grenade throwers. They should wear a distinctive badge. In each platoon there is a bombing party consisting of six men, including their commander. When one of these men becomes a casualty, a substitute should be ready to take his place. The bombing party should be stationed approximately in the center of the platoon. Boxes containing grenades should be placed near the party; they should be clearly marked as containing grenades and should be reserved for the use of the party in the first instance.

(*a*) Should the enemy have penetrated into a small portion of the trench, and should the troops on the spot not be able to deal with him by means of the bayonet or hand grenades, the bomb-

ing party should, without waiting for orders, immediately attack the enemy with grenades before it becomes necessary to erect a barricade in the trench. On a signal from their commander, the men of the bombing party equip themselves with hand grenades and collect round him.

All men of the party carry their rifles slung, bayonets fixed, and daggers ready, with the exception of the two leaders who do not carry rifles. The latter carry as many grenades as they can conveniently handle and should, if possible, be armed with pistols. The commander, similarly armed, follows the two leading men. If no pistols are available, the commander, who should cover the two leading men, carries his rifle ready loaded in his hands. The remaining three men follow the others a traverse in rear. They keep within sight of their commander and carry as many grenades as possible. When possible the grenades are carried in their boxes. The two leading men advance along the trench in a crouching position, so that the commander can fire over them. The interval between traverses is crossed by a rush.

(*b*) If the enemy has penetrated into the trench with a large force and a continuation of his attack is to be expected, as good a barricade as circumstances permit should be erected. The bombing party should at first remain on the defensive in rear of this barricade or behind a breastwork. Rifles should be unslung ready for use. The commander and the three rear men should take up their position behind the nearest traverse and within sight of the two leading men.

Bombing parties belonging to the platoons in support and in reserve should be stationed somewhere in the vicinity of the communication trenches, and should be brought up to a strength of eight men, including the commander.

99—German Training in the Use of Hand Grenades:

In training men for grenade fighting the following points are to be noted:

1. During practice with dummy grenades the thrower must always act as if using live grenades and think of the timing, so that when using live ones he is able to make the necessary pause; counting, e. g., "zwei und zwanzig" (22), "drei und zwanzig"

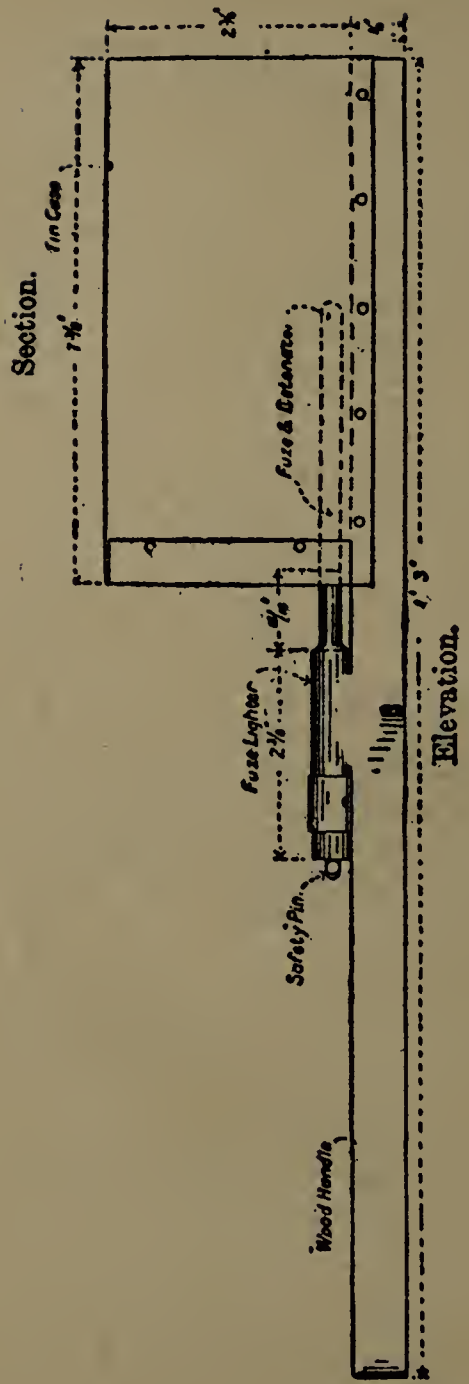

Section.
Tin Case
Fuze & Detonator
Fuze Lighter
Safety Pin
Wood Handle
Elevation.

Fig. 84

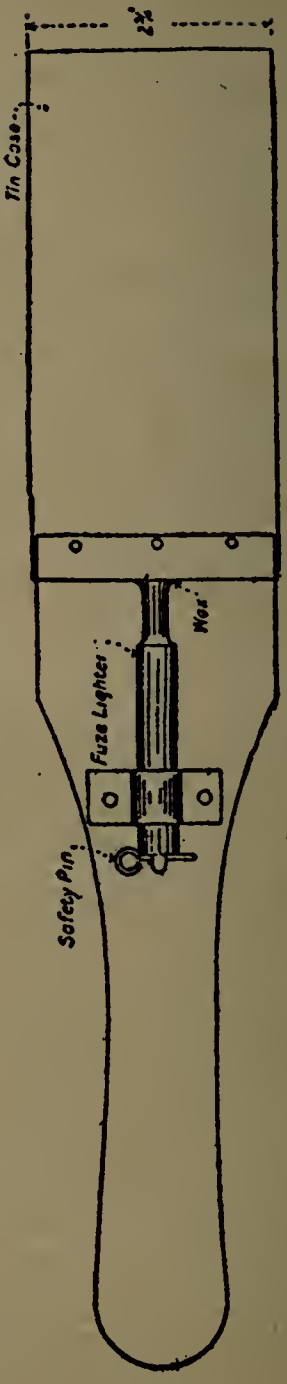

Tin Case
Fuze Lighter
Safety Pin

Fig. 85

(23), "vier und zwanzig" (24), appears practical. These three numbers give the correct amount of pause approximately.

As a general rule, the grenades are thrown too soon. It must be made clear to the bombers that this practice is quite wrong and can have disastrous results; for the enemy has time to avoid grenades or to throw them back or to one side as the case may be.

2. When the bombing squads of the platoons are fully trained, a second squad of each platoon is to be formed and trained. The first and chief bombing squads of platoons are, however, to be given further training every 14 days. Lieut. Helferich will report to me when he considers the bombing squads of the various companies fully trained. I shall then take steps to verify this.

3. The bombing squads and also the first squad of the bombing platoon are to be armed and equipped as follows:

Nos. 1—4. Pistol, dagger, and 6 grenades each.

Nos. 5—8. Rifle, 6 grenades, and 25 sandbags each.

4. Trench tactics will be practiced as shown below:

No. 1. Thrower.

No. 2. Carrier.

No. 3. Thrower.

No. 4. Carrier.

L. Leader

Nos. 5 and 6. Carriers.

Nos. 7 and 8. Spare men.

It is essential to keep the men extended in order to facilitate freedom of action and to enable them to dodge the enemy's grenades, but care must be taken that cohesion is not sacrificed in consequence.

Each squad must be so trained that every man can take the place of any other in it.

The leading man (No. 1) only will throw, the carrier (No. 2) will prepare the grenades.

Two cases may arise when Nos. 2 and 3 will also throw—(*a*) at the moment of making an attack in order to surprise and confuse the enemy with a sudden shower of grenades. As soon as the attack is in progress Nos. 2 and 3 will cease throwing.

Fig. 86

(*b*) When the resistance is too strong for the leading thrower to overcome it by himself.

5. The sandbags carried by No. 5-8 serve for the rapid construction of a barricade which is held with rifles.

One man, by means of his haversack strap, can easily carry 25 sandbags on his back and, with rifle slung, experiences little inconvenience.

6. The greatest attention is to be paid to the instruction of the leaders, for they will have to act on their own initiative in most circumstances.

In the bombing platoon the position of the platoon commander varies with the situation, but, as a general rule, the most suitable position would be with No. 3 group.

7. In trench fighting the platoon commander or squad leader must pay particular attention to the following points:

(*a*) See that every man is provided with six grenades.

(*b*) See that there is no crowding, in order to minimize the risk of casualties from a well-aimed enemy bomb. There is always danger of crowding during a check in the advance.

(*c*) When resistance of the enemy is not too great, the advance must always be continuous. Special attention must be paid to the supply of grenades.

(*d*) As soon as a traverse has been taken No. 2 calls out "Cleared" (Geräumt), the squad leader gives the command, "Advance" (Vor). Every section of the trench captured must be at once occupied by riflemen.

(*e*) The squad leader must be provided with small white flags which he will place at intervals on the top of traverses to mark the progress of the attack. This will prevent bombing parties which are working up the same trench in opposite directions from bombing each other by accident.

Small white flags will be made and taken with the men when they carry out training.

(*f*) Should the resistance of the enemy be strong that further advance is impossible even with the help of Nos. 2 and 3, the construction of a barricade must be proceeded with at once. The squad leader will give the command, "Sandbags up"

(Sandsäcke vor). The platoon commander can then decide whether it is possible to relieve the bombing squad and continue the attack, or whether to call a halt in the operations.

The construction of a barricade at *a*1 will be scarcely possible, owing to the number of the enemy's grenades which are being thrown, more especially if our intention is known to him.

The barricade will therefore be built at *a*, and, if possible, the space *a-b* will be roofed over with the stout planks as a protection against grenades.

Nos. 1-4 will hold back the enemy until the barricade is completed.

(*g*) Should it be necessary to block a communication trench, a good thrower at *a* will give the necessary protection to the remainder, who will build the barricade at *b*.

8. The question of the supply of hand grenades is of the utmost importance.

(*a*) *Supply during an attack across the open.*—If the first wave of the assault has succeeded in entering the enemy's trench, communication to the rear must be kept up so that sandbags, containing about six grenades each, can be passed forward continuously.

(*b*) *Supply in the trench.*—No. 1 (thrower) will only use the grenades which are passed up to him—never his own, which must be kept as a reserve for an emergency.

In grenadier platoons every squad except the first must be provided with a small box of grenades or with three or four sandbags each containing six grenades. The passing up of grenades should be thoroughly practiced.

100—German Hand Grenade Training:

Training in fighting at close range with hand grenades will be carried out by officers who are acquainted with all the details of this weapon and have had practical experience of its use in the field. The officers have first to train the men detailed as bombers and then to occupy themselves with the further individual training of the bombing squad.

Training takes place on ground specially set aside for the purpose (Handgranatenstand), where the precautions for safety

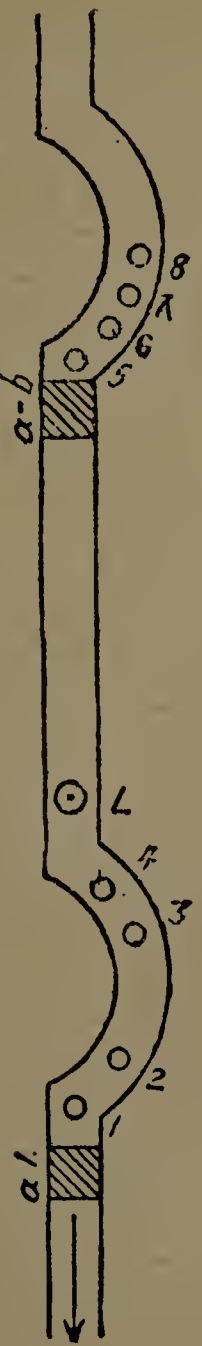


Fig. 87

laid down in instructions "Hand and Rifle Grenades," page 28A, are properly carried out, and where various targets (trenches with loopholes and entanglements, sapheads, machine-gun emplacements, farm buildings, and firing lines represented by screens) are provided. The course of training will be divided into the following parts, viz:

(*a*) Instructions in the various patterns and construction of grenades, the nature and effect of the explosive and detonators employed, storing, fusing, carrying and using bombs and precautionary measures to be taken.

(*b*) Drill with unfused practice hand grenades. Officers should next instruct the men individually in bomb throwing at a specified range at different targets. Men should be practiced in throwing when standing, kneeling, and lying, and finally actually in trenches. The bombing section should be instructed in grenade throwing in specified cases, such as attacking a trench, bombing a trench, assaulting fortified buildings, machine-gun emplacements, etc. Men should be practiced in springing out of trenches, doubling, throwing themselves down, springing up, pulling the friction lighter on a signal or whistle, throwing and lying down again, etc. From the start particular attention should be paid to making the man take the grenade in the same hand as he uses for throwing it (left-handed men in the left hand (and using the other to pull the friction lighter, so that time (5½ seconds) required for throwing the bomb may not be cut short or even entirely used in changing hands after lighting the bomb.

(*c*) Drill with fused practice hand grenades.

Men should only proceed to practice with live bombs after ease, assurance, and safety in the former practices have been attained. As the detonators bursts the shell of the grenade and can send fragments flying, great caution should be observed. These practices should teach the men to estimate the duration of the fuse and enable them to choose the proper moment for throwing. The habit which has arisen in various places of making the man count three or five before throwing is absolutely forbidden. The habit may lead to the man's counting so slowly that the bomb actually goes off in his hand. Haste and exaggerated speed in throwing are, however, quite wrong. The man in

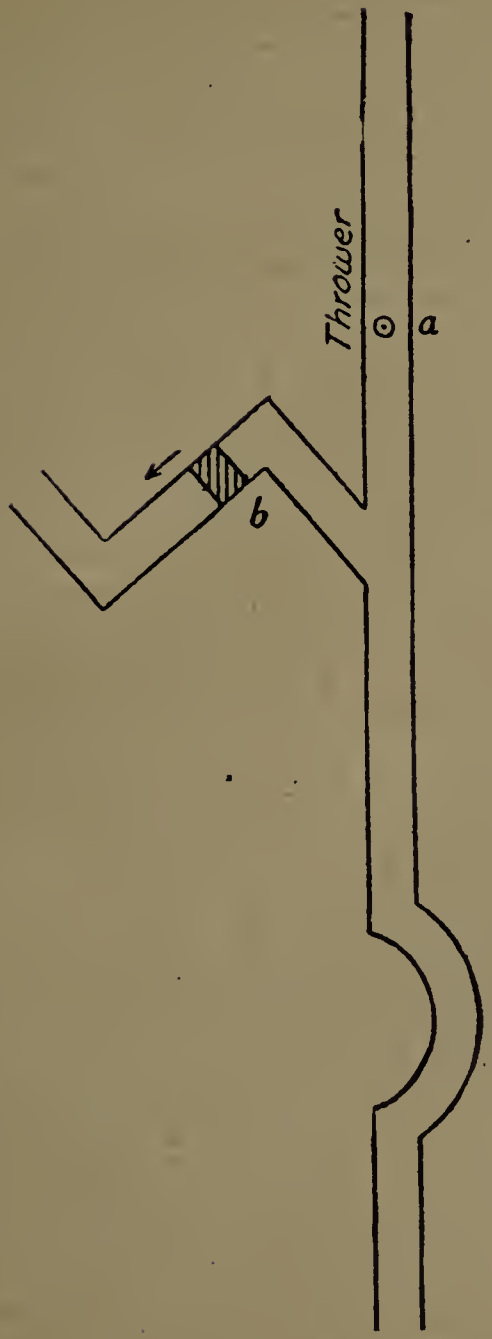


Fig. 88

his anxiety is likely to throw wide. The length of the fuse (5½ seconds) gives time for pulling the friction lighter and proper aiming and throwing. On the other hand, the 5½ seconds is purposely short so that the enemy can not have time to pick up the grenade and throw it back.

After assurance in practices (*b*) and (*c*) has been gained, classes may proceed to (*d*).

(*d*) Practice with live bombs. In accordance with regulations for safety (Instructions "Hand and Rifle Grenades," p. 28A), only one man will throw, the others taking cover. Every man, before being regarded as properly trained, must have thrown several bombs successfully. Officers intrusted with the training of bombers will inspect the storing and safe-keeping of hand grenades in the front trenches and in their depots, and will see that the bombs which have become unusuable are duly replaced. For depots connected with pioneer parks the pioneer officers concerned are responsible.

On behalf of the army commander.

The Chief of the General Staff.

101—German Training:

Training will be carried out within the company under the company commander. As a general rule, all officers, non-commissioned officers, and men should be instructed. The senior officers—e. g., battalion commanders—will insure that the training carried out by companies is adequate.

A bombing field will be laid out in the vicinity of all billets. Practices should be carried out according to the experiences of actual fighting and made as varied, stimulating, and instructive as possible. The main purpose of the training is to make a man confident in the use of what at first appears to him a most uncanny weapon, and to convince him of its great effect when properly used. Competitions in throwing between companies, battalions, and regiments will do much to promote efficiency.

Particular attention is drawn to the regulations of the Gen. Kdr. concerning the observance of precautionary measures during practices in live bomb throwing.

The specially picked bombing section mentioned in A. O. K. 4 will provide a bombing squad in each platoon, one non-com-

missioned officer, and eight men strong, who should be chosen for their coolness and experience, volunteers, if available, being selected. These three bombing squads can be used by the company commander, either separately or together, during an attack, a counter attack on lost portions of our trenches, or on any other occasion. The battalion commander can, if he thinks it desirable, employ the bombers of several companies together. Each man can carry up to 20 grenades. The method of carrying should be the subject of careful experiments. The following methods are worthy of consideration: Carrying on a strap, or in two sandbags hung around the neck. Bombers do not carry either rifle or bayonet, but are armed with revolver, trench dagger, and a short spade with a sharp edge, or instead of the latter a knobkerry. To insure a proper supply of bombs, a carrying party must be organized as demanded by the circumstances.

102—German Use and Application of the Grenade:

The hand grenade is both an offensive and defensive weapon, and, as such, indispensable. Specific rules for procedure in different phases of fighting can not be laid down.

In the case of a counterattack on lost trenches the fighting should, as a general rule, be so arranged that the trench is methodically cleared bay by bay and at once occupied and consolidated by the sandbagging party in rear of the bombers.

Bombers will be similarly employed during an attack on a hostile position. Bombers will in this case be very useful on the flanks for clearing the adjoining trenches and for repelling the inevitable counterattack.

Should the enemy make a frontal attack on our postion, bombs will be thrown by the entire trench garrison as soon as the enemy comes close enough. The choice of the right moment for the change from rifle to grenade is a matter for the platoon or section commander, and very often for the individual man. Great emphasis should be laid on this point during training, and men should be shown that a premature use of grenades is useless and may be fatal.

CHAPTER X.

SUGGESTIONS FOR SYLLABUS OF TRAINING

PART 1.

103—Elementary Training:

The following subjects should be included in the course:

Lectures.—(*a*) Handling grenades, and precautions necessary.

(*b*) Description of grenades in use and detailed description of Mills grenade.

(*c*) Care and storage of grenades.

(*d*) Organization and tactics of bombers in attack and defense, including tactical use of rifle grenades.

Practical.—(*a*) Throwing dummy grenades in open and in trenches.

(*b*) Group practice, one man throwing grenade, one keeping up supply of grenades.

(*c*) Practice in squads of eight, under a leader, working up trench with dummy grenades.

(*d*) Throwing live grenades, individual practice.

(*e*) If possible, practice in squads of eight, under a leader, with live grenades.

Following is a suggested syllabus for an elementary course when only three days are available:

First day.—Opening lecture on detonators, fuses, igniters, and grenades, and their properties.

Demonstration of action in throwing grenades in various positions in the open by instructor, followed by practice by class.

Detailed description of Mills grenade and precautions to be taken with it.

Practice in throwing dummy grenades at 25 yards—(i) Into a trench or pit; (ii) out of trench; (iii) over a traverse.

Demonstration of the use of the Mills grenade as a rifle grenade.

Short drill to explain duties of various men in a grenade party.

Second day.—Questions on previous day's work and drill.

Practice in throwing with dummies individually and in groups, in the open and from trenches.

Lecture on care of grenades.

Lecture on organization and tactics of bombers.

Demonstration by trained bombing squad of method of working down a trench.

Third day.—Questions on previous day's work.

Lecture on organization and tactics of bombers.

Individual throwing of live grenades.

Practice in squads of eight, under a leader, working down trench with dummy grenades.

Demonstration of method of blocking a trench.

Squads of eight, under a leader, working down trench with live grenades.

There should be a prepared training ground at all rest billets, so as to prevent delay in training when battalions come out to rest.

Men should first of all be practiced in throwing at measured distances in the open with dummies.

A good method of preparing the ground is to mark on it a series of double lines, each double line being 3 feet wide, to represent the width of a trench. The base lines, also 3 feet apart, between which the throwers stand, should be 20 yards from the first double line; then come four more rows beyond the first one, at distances of 25 yards, 35 yards, and 40 yards.

Having once mastered the first distance the men should then throw at the farther distances in turn.

The squads can be divided into two groups of four men, one group returning the dummies to the group throwing from the base line; by this means no time will be lost and every man will be kept interested in the proceedings.

As soon as the man has obtained a certain amount of proficiency in throwing in the open he should next be practiced in throwing from behind cover, which is the normal condition under which grenades are thrown in action.

Arrangements for practicing in throwing should be provided in all billets and handed over when the occupants are changed as "billet stores." "Cages," as described below, are suitable for throwing practice. They require little material, either for construction or upkeep, and instruction is as good as with trenches. They are especially suitable in low-lying districts, where trenches can not be kept dry.

Cages can be made as follows (see fig. 89).

104—Throwing Cage:

(*a*) *Throwing cage.*—Consists of four posts, which project 8 feet above the thrower's platform. The sides can be made of wire netting or such other material as may be available. The front face should be boarded, the top 1½ feet of which can be removed about 6 inches at a time. The thrower stands inside the cage and throws over the front face, the height of which can be adjusted, according to the proficiency of the thrower, either to a height of 6 feet, 5 feet 6 inches, 5 feet, or 4 feet 6 inches, by removing one or more boards. During wet weather a trench board, upon which the thrower can stand, can be placed inside the cage.

(b) *Target cage.*—The target cages are similar to the thrower's cage, but the front face need not be boarded, nor need the sides be more than 3 feet high. This cage can be made of any length and traverses placed in it at any interval as desired. The most elementary cage would be placed in direct prolongation of the thrower's cage. By placing others at different angles the bomber can be practiced at throwing at different angles as his proficiency increases. These cages are of particular value in elementary instruction, as the thrower after completing his practice can see the result of his throwing.

Instruction should also be given in indirect fire, one man observing, the other throwing. The observer, using a periscope or direct observation, correct the thrower's aim by calling out after each dummy grenade is thrown, "Shorten six yards," "Two yards more right," etc.*

* The following method of direction should always be used by the observer: "— yards front (half right, half left)" (to give thrower the distance and direction of target).

After a throw: "— yards more right (left)" (to correct direction); or "Lengthen — yards" (to corect distance); or "Shorten — yards" (to correct distance); or "Repeat" (if grenade has fallen in right place).

As soon as a good standard of accuracy has been reached the men should be formed into squads and instructed in trench work. As this instruction is the most important part of a bomber's training, it should be progressive and carefully thought

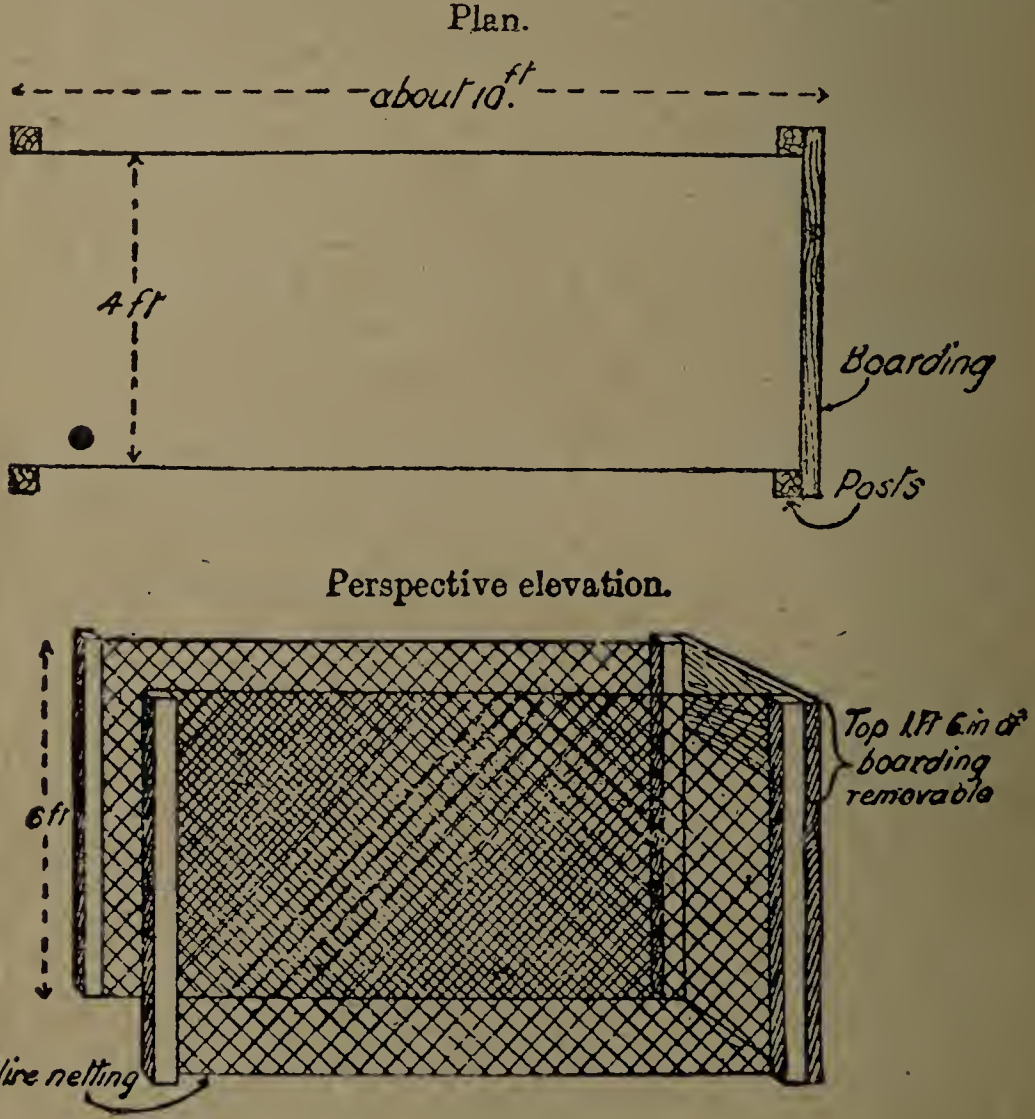


Fig. 89

out, the practice being conducted at first in slow time as a drill in which all detail is explained and all faults corrected. The practice should be gradually quickened up and the party allowed

to work by themselves, the practice being criticized on its conclusion. The importance of all members of a squad being equally conversant with the duties of all numbers must be remembered, and the numbers changed round accordingly. A plentiful supply of dummy grenades must be available on all occasions when trench work is practiced.

105—Advanced Course:

The following subjects should be included:

Lectures.—(*a*) Details of grenades of various types, including the German.

(*b*) Details of rifle grenades and throwers.

(*c*) Organization and tactics of bombers in attack and defense, organization for raids or large attack. Cooperation of machine and Lewis guns, tactical use of rifle grenades and throwers.

(*d*) Supply of grenades in an attack.

Practical.—(*a*) Improvement of accuracy and length of throwing hand grenades.

(*b*) Use of rifle grenades, rifle-grenade stands, and throwers.

(*c*) Various practices in attack and defense.

(*d*) Practice in rapid and continuous throwing.

(*e*) Throwing at night with live grenades.

(*f*) Methods of "blocking" a trench.

Great stress must be laid on throwing discipline. One well-placed grenade is worth any amount of grenades thrown indiscriminately.

106—Program of Four Weeks Instruction in Dummy Grenade Throwing for All Infantry Units of Division:

Each company having:

1. One hour a day to throw dummy grenades.
2. A suitable ground.
3. A sufficient number of dummy grenades.

Instruction should proceed as follows:

First Week.—Movements of throwing only. (Standing.)

(Kneeling-prone-rising and prone.)

No dummy grenades should be used at all.

Men ought to be taught and drilled individually, instructor passing from one man to another correcting each movement.

Under no circumstances whatsoever, should the men go through the movements of throwing all together. (Such as in physical drill.)

Men ought to be able instictively to go through all movements of throwing perfectly, without hesitation or delay at the end of one week.

Second Week.—Throwing dummy grenades, standing in wire-cages. (Three feet wide.)

No throwing in the open to be allowed.

No throw to exceed 25 yards.

Third Week.—Throwing dummy grenades—standing, kneeling and prone. (No throw to exceed 25 yards.)

Fourth Week.—Throwing dummy grenades in all positions according to different ranges on drill ground. (Accuracy—distance.)

After the end of the fourth week, all units to keep on training an hour a day, according to program of fourth week.

107—Instructors to Bear in Mind:

1. That the training of men must proceed very slowly. (All individual efforts to throw far during the first two weeks being unnecessary and dangerous.)

2. That nothing can take the place of dummy grenades. Consequently, if the latter are missing, it is better to go on drilling the men in the movements of throwing, than in making them throw stones, sand-bags or other articles whose weight and shape do not correspond to the real missiles.

3. That it is absolutely unnecessary and unwise to lecture to the men on the different types of grenades, the instructors bearing only on dummy grenade throwing for the time being.

Considering that up to now only one officer per battalion in the infantry regiments has received grenade instructions, it is advisable for each instructor to train at least one sergeant and one corporal per company for a week before beginning to drill enlisted men.

PART 2.

108—Suggested Tactical Problem for Grenadiers:

Situation.—Red (caps) has effected a lodgment in a front-line trench of Blue (hats), and is now driving Blue down a communication trench toward Blue's second-line trench.

NOTE.—Actual trenches should be constructed, and umpires should conduct the problem, making decisions on the spot, such as ruling men out as killed, requiring one side or the other to fall back, permitting them to advance, etc.

Solution.—Red is preceded by two riflemen with fixed bayonets, whose duty it is to occupy the angles of the trench in succession, so as to sweep straight sections and prevent the grenadiers from being rushed. Red also brings up machine guns and riflemen to the front-line trench just captured from Blue to cover the advance; but the grenadiers do not carry rifles.

For grenades use small sandbags with an ordinary firecracker to simulate explosion. Each thrower should be followed by a carrier with a basket or gunny sack filled with grenades (40 to 50), which are passed to the thrower one at a time; and a supply detachment should be bringing up grenades from the depots in rear. Men in the captured Blue trench, provided with periscopes, should coach the throwers, correcting the fall of grenades.

When the Red is halfway down the communicating trench the umpire decides that his advance is checked. Red then passes up sandbags and builds a barricade at the farthest point reached. While his riflemen are holding this barricade, assisted by the throwers, a second barricade is erected about halfway back to the captured front-line trench. The first barricade is solid across the communicating trench; the second is in two parts, each extending a little over halfway across the communicating trench, and not opposite each other, so as to leave a passage for the throwers to run through, throw their grenades, and run back to shelter.

While these barricades are being built, mine the walls of the communicating trench between the barricades with half a dozen small mines (2 pounds), and set them off with a slow match. This blows in the trench walls, and makes a place which the enemy (Blue) must cross unprotected from rifle fire, if he attempts a counterattack.

Red now drives Blue out of the supporting (second line) trench by the use of rifle grenades or gun bombs, etc.

[NOTE.—The first and second line trenches are about 100 yards apart.]

As a variation, for expert grenadiers, put dummy figures in the Blue trenches and use live grenades in the attack.

PART 3.

109—Assault Prepared by Grenades.—Executed by a Small Group of Skirmishers:

The assault is prepared by a small group of skirmishers throwing grenades in cases where a group of skirmishers has succeeded in taking position in a shelter at a short distance from the enemy. The exercise is practiced on irregular ground in order to avoid improbable situation and to make individual advance easier. The group of skirmishers is commanded *either by a noncommissioned officer* or by a man designated by the instructor.

PREPARATION FOR THE ASSAULT.

Points on which to give instruction.	*Features to represent.*
The skirmishers *slip into the shelter which is nearest* to the enemy.	Ground will be chosen to represent a shelter or a dead angle at some dozens of meters from the enemy position.
The chief of the group has his men fill the magazines of their rifles and *fix their bayonets,* which they conceal.	
He arranges the signal for the assault.	
The chief of the group designates a certain number of skirmishers (preferably automatic riflemen) *who conceal themselves carefuly* and hold themselves in readiness to fire upon any enemy who may try to stop the movement of the grenadiers.	Have several rifles appear in the enemy loopholes, skirmishers firing over the parapet, grenadiers whose arms are visible for a moment.

Chosen grenadiers or skirmishers supplied with grenades (have the grenade belonging to the group collected) approach the enemy position, using the entrenching tool where necessary to open the way completely.

The grenades are thrown by the grenadiers as soon as they are within throwing distance (reserve the O. F. grenades for the last).

(The use of V. B. (rifle) grenades simplifies the work of the grenadiers and covers their movement.)

A non-commissioned officer, placed in the position of the enemy skirmishers, watches the movement. He immediately puts out of action any assailant who remains exposed more than 3 or 4 seconds.

CARRYING OUT THE ASSAULT.

If there is opportunity, make several *false assaults* (feints) in order to *mislead the enemy* and to oblige him *to show himself* to our skirmishers who are ready to fire.

At the signal, the *assault should be made in one quick rush,* and *without making any outcry.* Shoot every enemy who shows himself.

Have one or two enemies make their appearance.

PART 4.

110—Combat on the Enemy Position:

(Exercise for a group of skirmishers.)

This exercise *is never practiced separately;* it is added to one or the other of the *two preceding exercises in assault, but only when they have been well learned,* so as not to cause disorder by the multiplicity of details. The exercise is carried on on a prepared practice ground, representing *either a group of trenches* (see figure below) or a point of support on *the field of battle*

which has been hastily organized (hedges, borders of woods, village etc.).

The instructor determines the features to be represented. He has the enemy represented by several groups of skirmishers, commanded by non-commissioned officers to whom he has given special orders. Each non-commissioned officer is charged with keeping good order and taking note of errors. The non-commissioned officers stop the exercise when the assailants have arrived within a few paces of their groups. (See the examples of preparation of practice grounds.)

CARRYING AND CLEANING UP OF THE FIRST TRENCH.

(Cleaning up which must be done by each skirmisher as he passes.)

Points upon which to give instruction.	*Feature to represent.*
	Place dummies in the trench.
Leap right over the enemy trench. Do not descend into the trenches or communication trenches, except to pass through them, if they are too large to jump over, or to clean them up quickly; always attack on the open ground so as not to be delayed and so as to permit the whole line to take part in the fight.	
An armed adversary should never be left in one's rear. This is necessary to avoid being shot in the back. Make sure that the Germans lying in the trench are dead.	Carefully conceal a few men and have them fire upon the assailants from the rear if they are not discovered.
Seek out the shellers at once, so as to prevent the enemy from getting out of them. *Throw grenades into the openings.* The openings are not always easily distinguished, because they are often partly	Represent shelters under the parapet and shelters opening into the communication trenches. Have several men run out of these. If the opening is not quickly covered, represent at the exit of the

obstructed by the bombardment.

Disarm the prisoners and *deliver them* quickly to the wave charged with clearing up the trench, then *rejoin your unit.*

(Clearing up the trench is completed by troops especially charged with this duty.)

shelter a serious resistance such as will give the assailant trouble.

Represent the wave whose duty it is to clear the trench by several men provided with certain insignia.

FIGHT TO FORCE INTO THE OPEN ENEMY GROUPS WHICH RESIST.

When a man has no enemy directly before him, he should *help his neighbors who are struggling with an enemy* group by taking the enemy in the rear or the flanks.

When a group resists obstinately in a corner of the trench, the groups of attackers who have entered the trench to the right or left attack the resisting group by advancing along the trench; to such an advance the defense can oppose only one or two rifles.

Group the enemy in certain places so as to represent knots of defenders separated by unoccupied spaces, as always happens after a preparation by artillery.

Advance through the communication trenches joining the trenches when they are near the route which is to be followed. This is to prevent the enemy's flanking the space between the two trenches.

Represent a communication trench organization as a firing trench organized as a firing are occupied by the enemy.

Reconnoiter at once the emplacement of a machine gun into action; *riddle it* with a hail of bullets. (This is the rôle of the automatic riflemen.)

Represent a machine gun firing through a loophole or going into battery above the parapet.

Try to take the machine gun in reverse. If possible, throw

Machine gun flanking the interval between two trenches.

grenades into the midst of the gun crew. Use the VB (rifle) grenade to destroy the gun crew from a distance.	Machine gun placed in the open field in a hole.
Before a counter attack, seek shelter quickly (this is the rôle of the machine gunners, fusileers, and automatic riflemen, who watch especially the attempts at counter attack); stop it by gun fire or *grenade throwing*. Then recommence the attack.	Represent several attempts at counter attacks by groups of skirmishers rushing in on the flank. Small counter attacks with grenades.

NOTE.—The exercise is first practiced once without any incidents being represented, so as to get fixed in the men's minds the form of the assault and the manner in which they are to re-form after surmounting an obstacle, before entering into the details of close fighting.

The points which the instructor should bring out are the following:

During the artillery preparation fire into the embrasures, the enemy loopholes, and on the emplacements of the skirmishers that can be spotted, in order to give the enemy the feeling of insecurity in the place from which he fires.

Watch the wall or the hedge so as to be ready to fire, during the charge, if an enemy rifle appears.

Drive the enemy from the wall and from the first hedge by means of offensive grenades.

Reform after carrying the wall and the first hedge.

Go around a house which can not be attacked in front.

Drive the enemy skirmishers from their cover in a little wood: Individual fighting from tree to tree by rifle fire at close range, throwing offensive grenades, and bayonet attacks on the dummies.

Attack on a house: Hidden skirmishers firing on all the openings (windows, doors, breaches) while the grenadiers slip up toward the house.

Examples of the organization of the ground for exercises in fighting in an enemy position.

Example of the organization of a group of trenches.

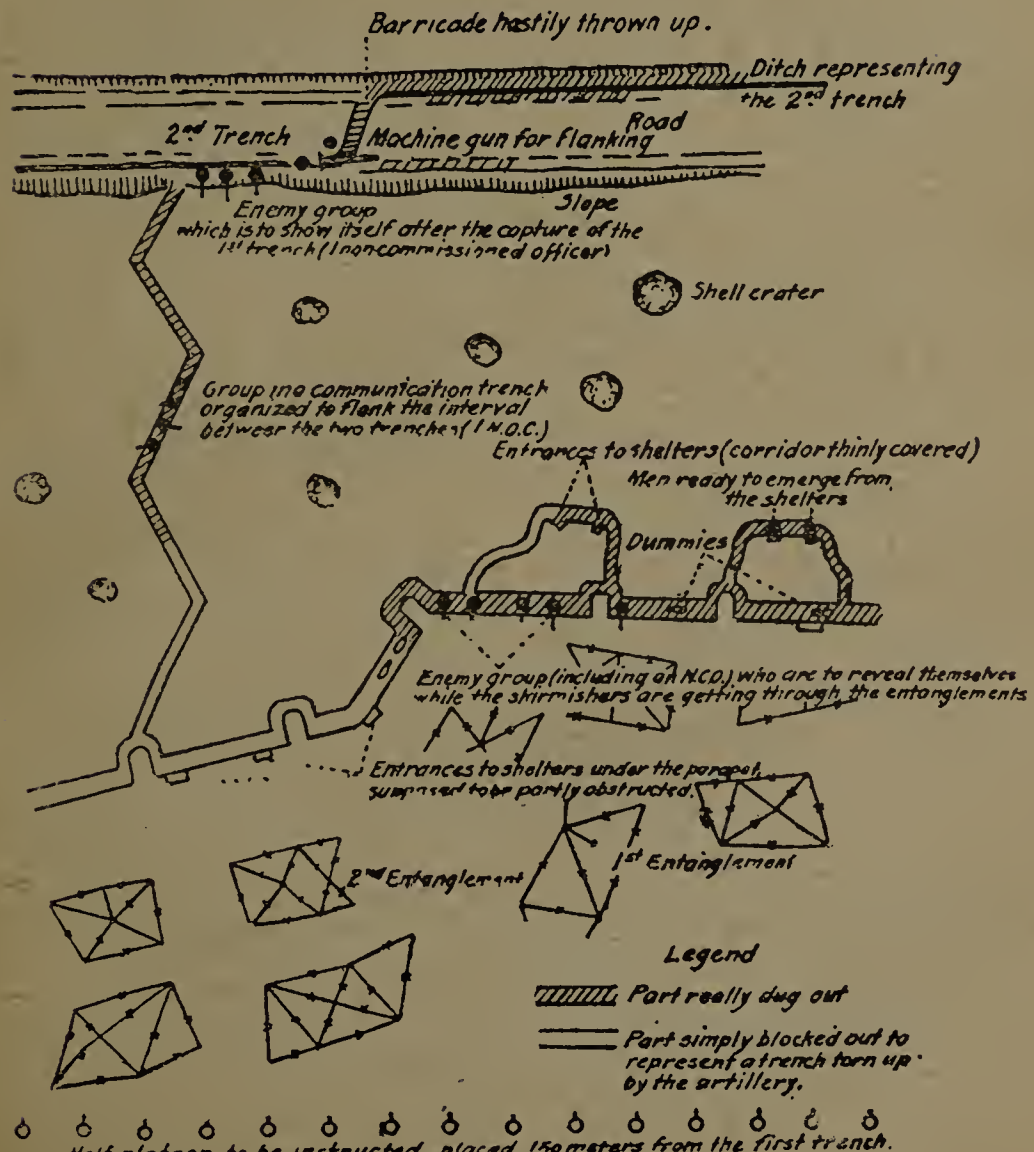

Barricade hastily thrown up.
Ditch representing the 2nd trench
2nd Trench
Machine gun for flanking
Road
Slope
Enemy group which is to show itself after the capture of the 1st trench (1 non-commissioned officer)
Shell crater
Group in communication trench organized to flank the interval between the two trenches (1 N.C.O.)
Entrances to shelters (corridor thinly covered)
Men ready to emerge from the shelters
Dummies
Enemy group (including an N.C.O.) who are to reveal themselves while the skirmishers are getting through the entanglements
Entrances to shelters under the parapet supposed to be partly obstructed.
2nd Entanglement
1st Entanglement
Legend
Part really dug out
Part simply blocked out to represent a trench torn up by the artillery.
Half platoon to be instructed, placed 150 meters from the first trench.

Fig. 90

112—Grenade Fighting by a Group of Skirmishers in the Interior of a Fire Trench or a Communication Trench:

This exercise is practiced by squads of half platoons. It is necessary to have at one's disposal, in the beginning, an element of a trench.

FIRST PART.

The enemy is not represented. The instructor teaches the skirmishers the duties of scouts, grenade throwers, and ammunition servers, and the mechanism of the advance. (Bombardment of the communication trench at the longest range pos-

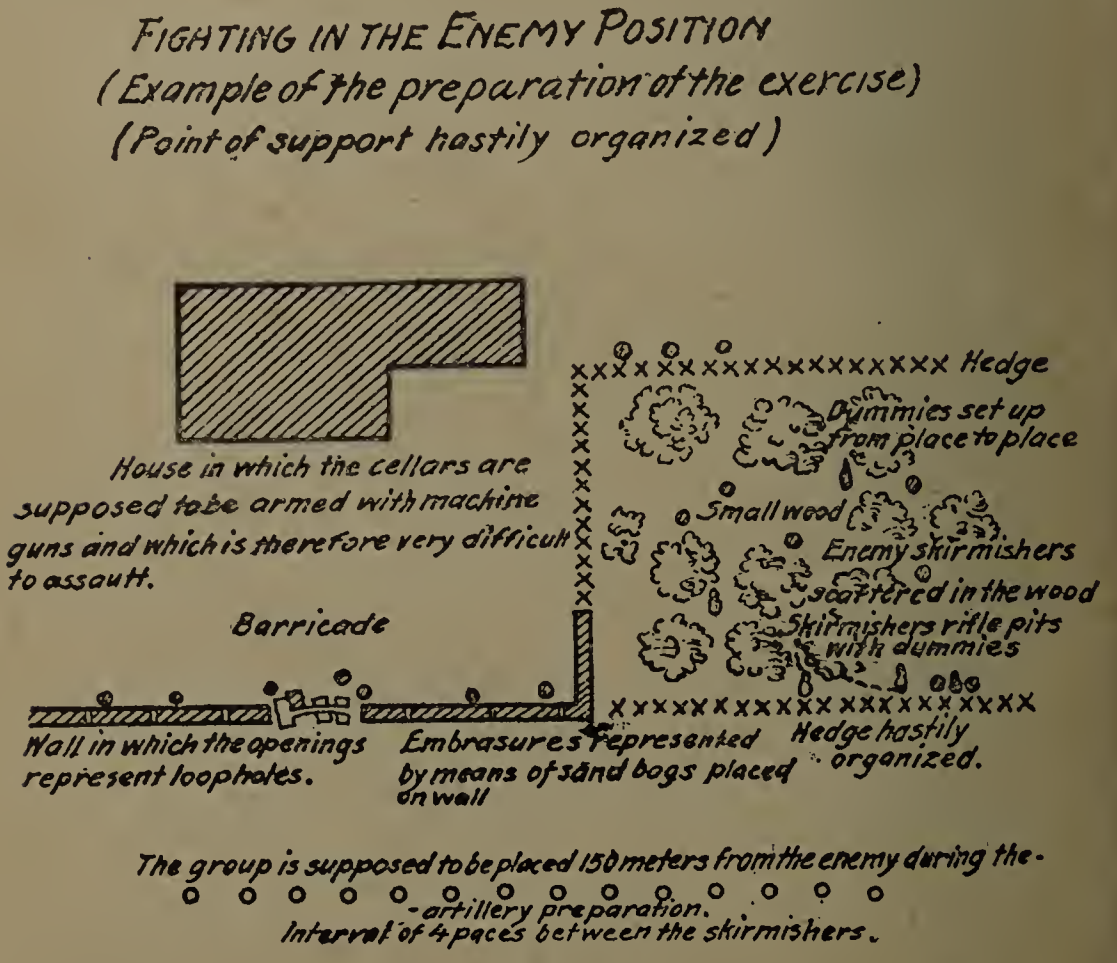

FIGHTING IN THE ENEMY POSITION
(Example of the preparation of the exercise)
(Point of support hastily organized)
Hedge
Dummies set up from place to place
House in which the cellars are supposed to be armed with machine guns and which is therefore very difficult to assault.
Small wood
Enemy skirmishers scattered in the wood
Barricade
Skirmishers rifle pits with dummies
Wall in which the openings represent loopholes.
Embrasures represented by means of sand bags placed on wall
Hedge hastily organized.
The group is supposed to be placed 150 meters from the enemy during the artillery preparation.
Interval of 4 paces between the skirmishers.

Fig. 90a

sible by bombers and VB (rifle) grenadiers. Reconnaissance and occupation of the cleared trench, first by scouts and then by bombers.) The instructor always forbids yelling and speaking in a loud voice.

SECOND PART.

The advance having been executed properly the instructor sets two groups of skirmishers, supplied with rag balls, against each other. The instructor, *in representing the losses,* endeavors to bring out the following points: The advantage is with the one whose aim is the most exact (the question of range can not be considered when rag balls are used). The advantage is also with the one who is the best supplied. Crowding together is the principal cause of losses.

The points of detail to be taught and the features to represent are the following: Quick construction of barricades with sacks of earth by the group which is for the moment the weaker. Carrying these barricades by the other group. (Teach the men how to destroy barricades by means of petards or sacks of grenades.) The means employed to regain superiority over the enemy. (Draw the enemy into an ambuscade, oppose him with a larger number of bombers.)

The instructor will also teach the men how to place *well-hidden skirmishers* (automatic riflemen) along the line of the communication or fire trenches to second the action of the bombers in keeping a watch for the heads or arms which the enemy grenadiers may show. He will put out of the fight any man who shows himself too long or who shows himself several times at the same place.

APPLICATIONS.

The foregoing exercises having been practiced until they are learned, the instructor *will practice the advance foot by foot, with rifle and grenade, over some kind of ground than a regular trench* (torn up ground, quarries, sunken roads, fences, enclosures, walls, etc.).

The instructor *will have the men themselves organize a grenade fight in groups of various strengths.* The opportunity to practice this exercise will occur particularly in the exercise in putting a captured position in a state of defense (counter attacks by the enemy), or in the exercise in the defense of a trench (counter

attacks organized and carried out by the skirmishers who are near the parts of the trench invaded by the enemy).

PART 5.

113—Organization of Captured Ground:

(Exercise for a group of skirmishers.)

This exercise is always preceded by a very short exercise in assault. The instructor will be able to give instruction to several groups of skirmishers at the same time by placing them on the ground at a certain distance apart, and arrange as at the end of an attack. The instructor will remove the officers and non-commissioned officers in the first part of the exercise; he will replace them in the groups when the time comes to improve the organization.

POINTS ON WHICH TO GIVE INSTRUCTION.

1. Men who find themselves in existing shelters immediately act as lookouts.
2. Each skirmisher organizes at once a firing position, and holds himself in readiness to fire. He establishes strong traverses to guard against enfilade or oblique fire, which are often encountered in a newly captured position.
3. The men placed on the wings of the group arrange their position in such a way as *to throw off any attempt at counterattack on the flanks of the group* (this is especially the rôle of the automatic riflemen and machine gunners).
4. When the individual shelters have been dug, the chief of the skirmish group separates his men into two parties—the lookouts (half or a third of the force), and the working party.

The working party keep their weapons within reach, complete the organization of the position (communications between the men of the group and with the rear, with the neighboring groups, shelters against artillery fire, and auxiliary defenses).

POINTS ON WHICH TO GIVE INSTRUCTION APPLYING ESPECIALLY TO THE ORGANIZATION OF A CAPTURED TRENCH.

1. Each soldier cuts a loophole on the parados of the trench (oblique loophole if the enemy is near by).

2. The skirmishers who are at the end of the captured portion of trench immediately construct a barricade. They hold themselves ready to repulse any counterattack with grenades. (Have the grenadiers of the group place themselves near the barricades at the ends. Collect grenades.)

3. The group is divided, in the same manner as before, into lookouts and working party.

4. The instructor will teach the men how to construct communications under fire, by means of working parties stationed from place to place in shelters (shell craters, etc.), who endeavor to establish connection with each other by extending their work foot by foot. If there are no shelters, the working party fill two or three sacks with earth, as a starter, to serve them as first protection in the place where they are to work.

FEATURES TO REPRESENT.

Enemy counter attacks (counter attack over the open ground or with grenades through the communication trenches). Enfilading or oblique fire.

PART 6.

114—Method of Using the Rifle and Bayonet when Attacking Round a Traverse:

1. Only men specially skilled with the bayonet should be selected as "bayonet men" with bombing squads. They must act as scouts as well as protectors to the bombers.

2. (1) When making an attack round left traverse (fig. 91 and fig. 92).

The rifle is held at what may be described as the "low port," i. e., slanting across the body, the bayonet pointing upward and close to the left shoulder; the left hand close to the left breast and grasping the rifle just behind the piling swivel; the right hand just behind the back sight.

Left foot forward, and the weight of the body poised for an immediate dash round the traverse with the right foot, at the same time as the bayonet is swung down to deliver a "point."

(2) For an attack round a right traverse—vice versa.

3. (1) When working round a left traverse to make an attack on any enemy low down on the ground, in a "dug-out," etc. (fig. 93).

The rifle point downward, the small of the butt passing under the right arm pit, the point of the bayonet just off the ground; the right hand grasping the rifle just behind the back sight, left hand just below the piling swivel; the left foot forward, and the weight of the body distributed ready to make an immediate dash round the traverse and to deliver a point.

(2) For an attack round a right traverse, vice versa.

Fig. 91

Attacking round a left traverse. (Back view.)

4. When moving along trenches in file (except the leading man), (fig. 91).

The rifle held close up against the right side with the finger through the trigger guard—i. e., the old "short shoulder."

The leading man should carry his rifle in the position of immediate readiness described in 2 (i)—viz., the "low port." (Note.—In these positions the rifles do not protrude beyond the traverse, nor show above the trench.)

5. Instructions to be observed by "bayonet men":

(1) Never go round a corner without being on the alert.

(2) Learn to use the bayonet with skill when the rifle is gripped behind the backsight with either the left or the right hand.

Fig. 92
Attacking round a left traverse. (Front view.)

(3) Become an adept in all "knock-out" methods with the rifle, etc., and be able to make a "point" even when lying on the ground.

(4) For night work the bayonet should be dulled.

PART 7.

115—Résumé of Training:

6. The object of elementary grenade training (which every Infantry soldier should receive) is:

1. To give the individual a practical knowledge of the working of the grenades in use.

2. To teach him how to throw them.

3. To make him acquainted with the general principles of the organization and the execution of a grenade attack, either as a separate operation or as part of a general attack.

A fair standard of accurate throwing with dummies and a working knowledge of the mechanism of the Mills grenade must be acquired before a man is allowed to handle a live one.

Fig. 93

Attacking round a left traverse, rifle held ready to make a downward point with the bayonet.

The action in throwing is that of overhand bowling. In the case of a right-handed thrower the body is turned half right, the right hand drawn back and below the waist, arm straight. The left arm is carried forward, arm straight. The left foot is advanced, the weight of the body being on the right foot, body bent back, eyes fixed on the mark (see pl. 1). The grenade is hurled with a circular swing of the right arm over the right shoulder, at the same time the weight of the body is thrown forward onto the left foot, every muscle being brought into play to propel the grenade (see pl. 1A). Expert bombers usually impart a spin to the grenade; the grenade should leave the hand at the highest point of the swing and should be thrown well into the air. For short distances it can be lobbed from the shoulder by an action similar to that employed in "putting the weight." A grenade may also have to be thrown with a bent arm from positions in a deep trench where a full swing is not possible, and this should be practiced.

Men should be taught that if a grenade with a time fuze like

the Mills is dropped in the act of throwing there is ample time to pick it up and throw it out of the trench before it explodes, and that they must do this immediately.*

Men must be taught to throw from a standing, kneeling, and prone position, though the latter position will seldom be used.

Distance is important in grenade throwing, but accuracy is essential. Bad direction results in waste of grenades and gives confidence to the enemy. Men must be taught to throw at a definite mark at a known distance even in the stages of preliminary throwing practice in the open. They must be taught to keep their eyes on the target while withdrawing the safety pin.

Men must be trained so that the removal of the safety pin before throwing becomes instinctive and automatic.† Practice, by numbers, is of value in the initial stages of training.

A suggested syllabus for an elementary course and some notes on training and physical exercises for bombers are given in Appendix 1.

Every infantry soldier should at the conclusion of his recruit training—

1. Have a sound practical knowledge of the mechanism of the Mills grenade and of its use as a rifle grenade.

2. Be able to throw a Mills grenade from behind cover to at least 30 yards with a good degree of accuracy.

3. Understand the principles on which a bombing attack down a trench is made and supported, and have taken part in several such exercises.

4. Have thrown a Mills grenade in practice.

The object of the advanced course of training which the bombers of company squads and the battalion platoon should undergo are—

(*a*) To improve accuracy and distance of throwing.

(*b*) To increase knowledge of the various types of grenades

---

* In throwing a percussion grenade from a trench care must be taken not to strike it against the back of the trench or this may cause it to explode.

† Even when throwing dummies men must be taught always to go through the motion of withdrawing the pin before throwing.

and how to handle them; this should include the use of rifle grenades and the various types of catapult and mechanical thrower, also the care and storage of grenades. It is essential that bombers should be instructed in the use of German grenades.

(*c*) The train bombing squads to work together on a regular system of grenade drill, each man having his definite position and duty in the various phases of attack and defense. The combined action of hand and rifle bombers must be carefully studied and practiced.

(*d*) The train parties consisting of several squads to work together with the remainder of the company, in various schemes of attack and defense, both by day and night.

The use of Pippin grenades, smoke candles, rockets and flares may also form part of the advanced course of training.

The following are the principal points requiring attention:

(*a*) Physical fitness is essential. Bombers should be exercised daily in running, marching, physical drill, etc., to keep them fit and supple.*

(*b*) Throwing practice should be carried out daily, but should not be overdone.

(*c*) Attack practices against a fire trench should be carried out above ground and while on the move, also in extending laterally to either flank from a section of captured trench by bombing over the traverses and down communication trenches.

(*d*) Defense practice should be carried out from a trench against another trench. The method of repelling a bomb attack down a trench should be practiced, as also the methods of blocking a trench against a bombing attack.

(*e*) After the initial stages it is essential that men should be trained in throwing under service conditions as regards equipment, steel helmets, carriers, etc. Throwing in gas helmets or with box respirators must be practiced.

(*f*) Continual attention must be paid to accuracy of range, which is just as important as accuracy of direction.

(*g*) Various types of trenches should be provided to enable practices to be properly carried out, e. g., traversed fire trenches, zigzag communication trenches with island traverses, etc.

---

* Some physical exercises for bombers are given in Appendix I.

(*h*) Practice with live grenades at night is necessary.

(*i*) Training in the use of the Mills rifle grenade (No. 2) is of the greatest importance.

8. The duties of the various men in a bombing squad of 1 non-commissioned officer and 8 men are as follows:

Nos. 1 and 2, bayonet men.—These should be specially picked for pluck and alertness; they should be good snap shots and handy with the bayonet. Their duties in action are to attack the enemy with the bayonet and clear the way for further progress; and also to protect the men behind them by rifle fire, if necessary.

In trench clearing they will be ahead of the throwers and work round each traverse in turn. It lies principally with the bayonet men to prevent the fighting becoming a mere grenade duel. Once the enemy is on the run, the bayonet men must give him no opportunity to halt and to commence throwing grenades.

Nos. 3 and 4, grenade throwers.—These should be chosen for their coolness under fire and must be men who can be trusted not to get flurried or lose their heads. They should be picked men, thoroughly trained in accurate throwing, and having a thorough knowledge of grenades. These men should be as lightly equipped as possible. They will require both hands to manipulate the grenade effectively.

No. 5, noncommissioned officer or leader.—He is in charge of the whole squad, and is responsible for controlling the fire, preventing indiscriminate throwing, and regulating the advance of the party. He will signal the members of his party down a trench by flags or some form of flare signal.* In action he will place himself where he can best observe the throwing and control the squad. In trench clearing he should usually be behind the first carrier. A periscope is useful, if available.

He will personally inspect each man of his party before they start off on the task allotted to them. He will examine the arms of Nos. 1 and 2, and insure that magazines are charged, that there is one round in the chamber, and that the bayonet is cor-

* A flare signal is to be preferred if distinctive and easily seen. There is a risk that flags may be left behind or captured by the enemy, and become misleading.

rectly fixed. He will see that Nos. 3 and 4 are correctly equipped, and that Nos. 6, 7, 8, and 9 each have their full complement of grenades in the carriers, and that each grenade is correctly fused. He will make one man of the squad responsible for observation to the flanks and for giving immediate warning of counter attack from the flanks, unless arrangements have been made for their protection by parties in rear. All the men should know who will take No. 5's place if he becomes a casualty.

Nos. 6 and 7, the carrier's (reserve throwers).—They will keep a watch on their respective throwers, and insure that they always have a grenade handy when required. They must be particularly careful not to follow too close on the thrower lest they should embarrass him in the act of throwing. They must be thoroughly trained in the duties of the throwers, and be ready to take their place in case of casualties.

Nos. 8 and 9, rifle bombers.—Their duties are to outrange hostile bombers when there is any danger of the attack being checked and thus, when necessary, to cover the advance of the squad. They can also cover the flanks of the squad, when required.

The reserve bayonet man, if only one bayonet man is used in advance of the party, may act as sniper. The duties of the sniper are to keep down the heads of the hostile bombing party, to break their periscopes and thus prevent them from observing their fire, and to protect his own squad from hostile snipers.

9. The following is an example of the method in which a grenade squad, organized as in paragraph 4, should be trained to work down a trench. (See fig. 1.)

On arriving at traverse 2 the bayonet men should place themselves in positions B1, B2, the first thrower at T1, behind the traverse, the first carrier immediately behind him at C1. The noncommissioned officer or leader at L in such a position that he can observe the fire and direct the squad. The leading rifle bomber should normally follow next behind the leader, who can then control both thrower and rifle bomber. The second thrower and carrier will follow next, with the second rifle bomber at the rear of the squad.

Crowding must be avoided, and if possible each man should be at a corner, round which he can move to avoid a hostile grenade

In support, further along the trench will be the blocking parties, riflemen, Lewis gun detachments, etc.

As soon as the bayonet men are checked, the leader will direct the first thrower to open fire. No. 1 thrower throws grenades as quickly as possible into the section of the trench held by the enemy.

On receiving the order "Report" from the leader, the leading bayonet man moves forward to see into the next bay and the trench behind the next traverse. If they are clear he passes back word and the whole party advances and take up positions at traverse 3 similar to those taken up at traverse 2. In this way the party work down the trench.

On reaching a branch or communication trench, or deep dug-out, the leading bayonet man reports to the leader who decides on the action to be taken.

(NOTE.—Every number in the squad should carry a proportion of smoke bombs for dealing with deep dugouts.)

The enemy once on the move should not be given time by the bayonet men to make a fresh stand. The bayonet men should always attempt to close with the enemy. A rapid and continuous advance is most likely to prove successful, and grenade throwing should only be resorted to when the bayonet men are held up.

In the event of a communication trench being encountered, as in the plan given, another squad would be brought forward to work down it, the first squad proceeding along the main trench until the objective is reached. If no provision has been made for a second squad—the communication trench not being anticipated—the leader at once sends the second bayonet man, thrower, and carrier, to work down the trench in question, accompanied by a blocking party and riflemen if considered necessary.

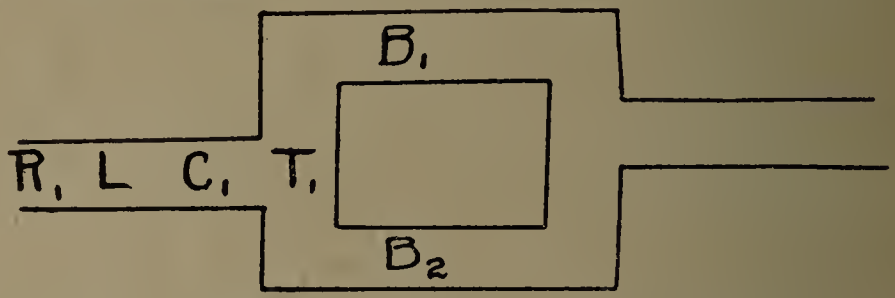
Should an island traverse be encountered, the leading bayonet men must watch both sides of it whilst the grenadiers are throwing grenades.

A suggested syllabus for an advanced course, and the tests which a man should be required to pass at its conclusion, are given in Chapter X.

Once men have been thoroughly trained in the groundwork of bombing, as much time as possible must be given to com-

bined schemes with the remainder of the company, and the following in particular must be studied and practiced:

(a) The cooperation of Lewis guns and Stokes mortars with bombers, either in a bombing attack down trenches or against a hostile machine gun which is holding up an advance.



(b) The organization and action of bombers and the men supporting them to an attack on trenches with deep dugouts, so that, immediately on entry into the hostile trench, men may be posted at all entrances to dugouts to prevent the enemy issuing.

(c) The rapid formation of a bombing party in an emergency, either in attack or defense, from the first men available.

(d) The use of smoke in the attack, either from 4" Stokes mortars, P grenades, smoke candles, or rifle grenades. Smoke can frequently be used most effectively by bombing parties in an attack on a hostile machine gun or strong point, or in village fighting, or to screen the retirement of a raiding party.

116—Precautions Against Accidents During Instruction:

11. The following precautions against accidents will be taken at lectures on grenades and during practice. Some of them are applicable at all times. These are marked by an *:

(1) No detonators or grenades with charges in them will be used unless a qualified officer or warrant officer instructor is present.

(2) At lectures only dummy grenades (that is, grenades without an explosive charge in them) and dummy detonators (that is, models in wood or metal to represent detonators, or empty detonators) will be used.*

* It is advisable that demonstrations with filled grenades should not take place inside a building.

(3) Dummy grenades and dummy detonators will be specially marked.*

(4) A dummy grenade will not be reloaded to serve as a filled one; its use as a dummy may have worn out or injured some part of it and may thus occasion a premature.

(5) Before commencing a lecture, or a practice in which dummy grenades are to be thrown, the instructor will examine the material very carefully in order to insure that there are no detonators or filled grenades (that is, grenades charged with explosive) included in it.

(6)* Men will be warned that live detonators, filled grenades, and especially filled grenades with live detonators in them (usually known as fused grenades) must be handled with care. The following rules should be impressed on all:

(*a*) Do not seize a detonator; hold it between forefinger and thumb.

(*b*) Do not drop, tread on, hit, or attempt to bend a detonator, or treat one roughly.

(*c*) Do not force a detonator into a grenade or holder. If it does not fit easily, another detonator must be used, and the defective one placed in a special box, and reported to an officer who will subsequently arrange for it to be thrown into deep water or destroyed.

(*d*) Do not force a safety fuse into a detonator when making a connection, but work it in gently for three-quarters of an inch, which is as far as it can go.

---

* Dummy detonator holders containing dummy detonators are supplied for No. 3 and No. 20 rifle grenades. They are distinguishable from live detonator holders by not being closed at the bottom.

Dummy detonators are at present issued empty and must be tested by inserting a splinter of wood, wire, etc. They will shortly be issued with a hole in the end about one-third of the diameter of the detonator, so that daylight can be seen through them. It should be noted that live detonators have four tiny holes in the end.

Dummy igniter sets are supplied for No. 5 Mills grenade. They are distinguishable from the live sets by a hole, about one-third of the diameter of the detonator in diameter, at the end of the detonator, and also by the cap having no central hole.

If no service dummy detonators are available, models in wood or tin should be made and used; unloading live detonators is a delicate operation, wastes fulminate, and should not be permitted.

Dummy grenades are supplied to represent No. 3, No. 5, and No. 20 grenades. They are painted white.

For numbers issuable to units and schools in France see G. R. O. 1473 and 1640.

Plan of attack, showing a section of trench made for practice attacks.

B=Bayonet man.
C=Carriers.
L=Leader (N. C. O.)
R=Rifle bomber.
T=Throwers.

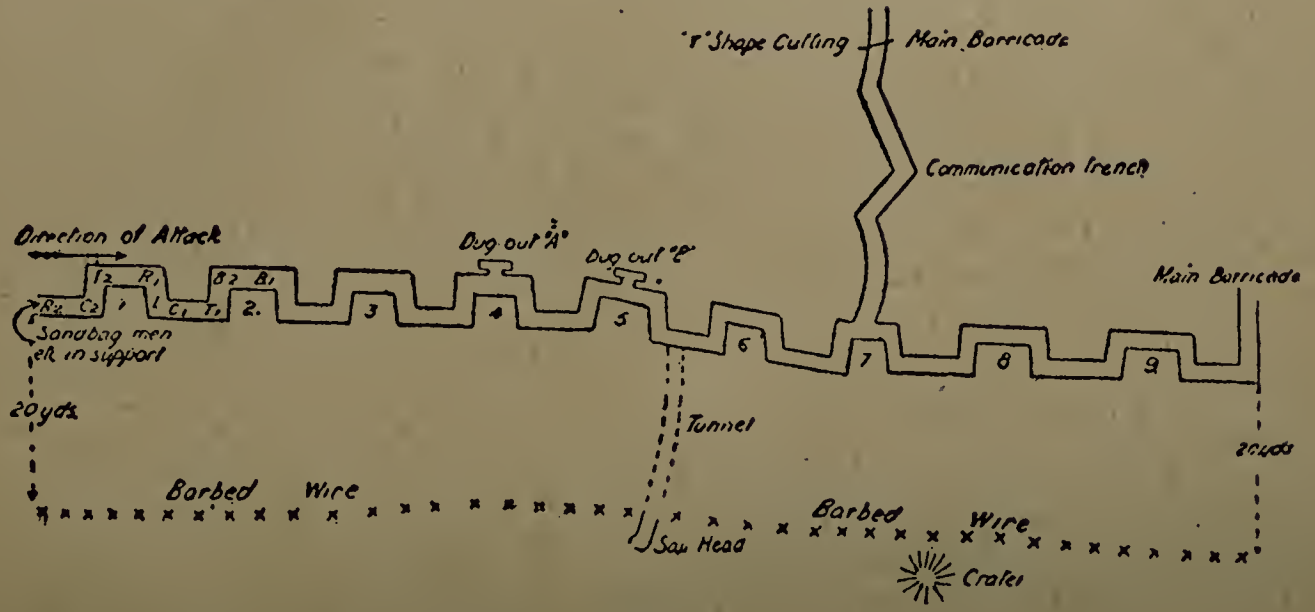


Fig. 94

(*e*) Do not attempt to pull a detonator off the safety fuse once it is crimped on; the only safe way is to cut the fuse above the crimping if it is necessary to remove the detonator.

(*f*) Do not leave a detonator lying about; a comrade may step on it and be injured.

(*g*) Do not hold a friction fuse lighter by the thick end, as you may set it off.

(7) At instruction a reliable man should be placed in charge of the detonators and kept apart from the rest of the party; he should issue detonators only on the order of an officer.

(8) At practice in inserting live detonators only one detonator should be used for each party and the men should come up singly, the others keeping at a safe distance or behind a traverse.

(9) A detonator or igniter will not be inserted in a grenade except on the practice ground and then immediately before the grenade is to be thrown, or for instructional purposes, as in 8 above.

(10)* The fusing of grenades by the insertion of the detonator (detonator holder) or igniter will not be carried out in proximity to a stack of grenades or boxes of grenades. There should be a definite place chosen, e. g., a hole in the ground with a tub of water in it, into which a grenade can be quickly thrown if ignition takes place, and cover should be close at hand for the men.

(11) At all practices with fused grenades the instructors and the classes will wear steel helmets.

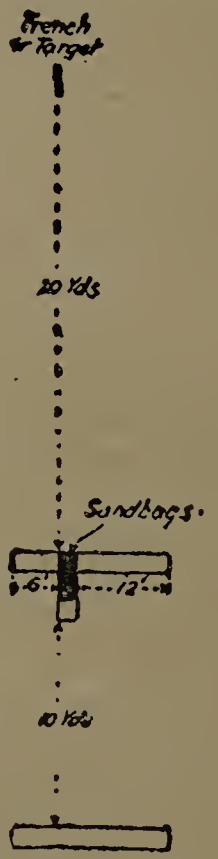
(12) During individual practice with fused grenades not more than one instructor and the thrower (firer in the case of rifle grenades), or in all two persons, will be allowed in the throwing trench at the same time; the remainder of the class will take cover before the grenade is thrown. At least one instructor will be present with these men to insure that they do not expose themselves.

---

* The following is a safety arrangement which has been found effective for preliminary instruction in hand grenade throwing; as soon as the men are sufficiently skilled they should throw from a trench. Grenades are thrown from behind a wall 5 feet high at a target. A wing 5 feet high (with sandbags on top of the forward portion to make it 7 ft. 6 in.) separates thrower and instructor from the rest of class, or the rest of the class may be behind a barricade further in rear.

Rifle grenades should, in elementary instruction, be fired by a lanyard through a box loophole or pipe built in a breastwork or parapet, the grenade being inserted from the front after the rifle is in position, and not fired until the two persons mentioned above are behind the breastwork or parapet.

(13) During practice with live grenades the danger area must be considered as a circle with a radius of 200 yards from a point where the grenade explodes; no one should be allowed within the danger area except under suitable cover.



(14) Grenades that fail to explode should be noted and the bombing ground carefully cleared up after conclusion of the day's exercises; on no account should filled grenades be left lying about.

(15) A live time fuse grenade failing to explode when thrown will not be lifted until at least one minute has expired, and then

only after careful examination. A percussion grenade which fails to explode will be destroyed without lifting. This can be done by firing a guncotton primer beside it.

(16) Should a fused grenade not be thrown, the detonator, or igniter in case of No. 5 (Mills) grenades, will be removed from it as soon as possible and in any case before it is returned to store; on no account will such an operation be carried out in any grenade store. It must be done on the ground under proper precautions for safety.

(17) The safety fuse used in the ignitors of No. 5 (Mills) grenades will be examined occasionally to see that it is not cracked at the bend, as this is likely to cause erratic burning. This applies to the igniters in store as well as to grenades when being fused in the first instance.

(18) All the special precautions given in the descriptions of the different types of grenades in Appendix III will invariably be observed.

(19) All inspection should be carried out in a good light.

117—Use of Mills' Rifle Grenade, No. 23:

The Mills rifle grenade (No. 23) is a short-range grenade. It is principally designed for use in support of hand-grenade bombers or riflemen in an attack on trenches.

The range that can be obtained increases with the length of the rod.

With a 6-inch rod the maximum range (at an angle of 45°) is approximately 90 yards.

Rifle bombers armed with the grenade are included in a bombing squad, and therefore all bombers must be trained in their use.

Throughout the attack the rifle bombers will keep in close touch with the squad leader in order to—

(*a*) Cover the advance of the bayonet men and throwers, and protect the flanks.

(*b*) Clear hostile blocks, arrow heads, and side trenches which are out of range of hand bombers.

(*c*) Prevent the enemy from sending up reinforcements and hinder his bomb supply.

DIRECTIONS FOR FIRING.

From the rifle with fixed bayonet and special cup attachment.

(*a*) Place the rod of the grenade into the bore and allow the grenade to slide down until the base plug rests on the bottom of the cup, the lever being on the opposite side of the cup to the bayonet.

(*b*) Insert cartridge.

(*c*) Turn safety catch of the rifle to the rear.

(*d*) Pull out the pin of the grenade.

(*e*) Turn the safety catch of the rifle to the front.

(*f*) Hold the rifle at the required angle and fire.

The rifle can be fired from three positions, viz:

Kneeling with the butt on the ground.

Standing with the rifle in the "on guard" position.

Standing firing from the shoulder.

When firing with the rifle in the "on guard" position, care must be taken that the rifle is clear of the hip.

The position should be chosen to suit the cover available. When firing standing, the bayonet should not show above the cover.

118—Standard Tests:

1. *First test (with dummies).*—To test accuracy of direction, length of throw, and endurance:

Position: Standing in a trench or cage 4 feet wide and throwing over a traverse 6 feet high. The bomber is allowed to jump up to get his direction before throwing, but no mark indicating direction may be used.

Targets (see fig. 9: (*a*) Cage (or trench) directly in prolongation of the throwing cage. Height of cage 3 feet, width 4 feet, length at least 30 feet; distance of thrower's traverse to enemy's traverse 25 yards.

(*b*) and (*c*). Two cages (or trenches) set at an angle of 45° to the thrower's cage; same dimensions as for (*a*), but the distance to the enemy's traverse to be 20 yards.

Number of grenades (dummies), 15: The bomber starts by

throwing into cage (*a*). As soon as he has got 3 into the cage, he goes on to cage (*b*) with the balance of the 15 grenades unused; as soon as he has got 3 into cage (*b*), he goes on to cage (*c*) and can expend the balance on getting 2 into cage (*c*). If the number of grenades is expended before 2 grenades have been thrown into cage (*c*), the bomber fails to qualify. This test is all one test and must be carried through continuously. It will not be divided into three separate tests.

2. *Second test* (*live grenades*).—Three live grenades to be thrown at a target, the officer conducting the test to decide on the man's capability.

3. *Third test.*—Rifle grenade (No. 23). Dummy grenades will be used:

Target: A cage (or trench) 20 yards long and 4 feet broad, into which the grenades are to drop.

Distance: About 70 to 90 yards.

Standard: Five grenades to be fired, of which 3 are to pitch inside the target.

Position: Behind a traverse as in 1. The firer may hold and fire the rifle as desired, so long as his bayonet does not show above the cover.

4. Fourth test (trench tactics).—Bombers to be tested by working down a trench or such other exercise as the officer conducting the test considers fit. To insure that each man knows the duties of each number in a squad, numbers should be changed round. Questions can be asked as desired.

5. Fifth test.—The officer conducting the test will ask questions to ascertain that the bomber understands the mechanism and objects of all types of grenades in use, including smoke grenades and candles. He should also be asked questions on German grenades.

The tests will be carried out in the order named above, except that, if more convenient, test No. 5 may be taken before No. 4.

These tests must be strictly carried out and will not be conducted by an officer holding an appointment junior to brigade bombing officer.

Only noncommissioned officers and men who pass the above

tests will be classified as trained bombers and be entitled to wear the distinctive bomber's badge.

A man must qualify in each test and must not go on to the next until he has qualified in the previous one.

Arrangement of Cages for Standard Tests.

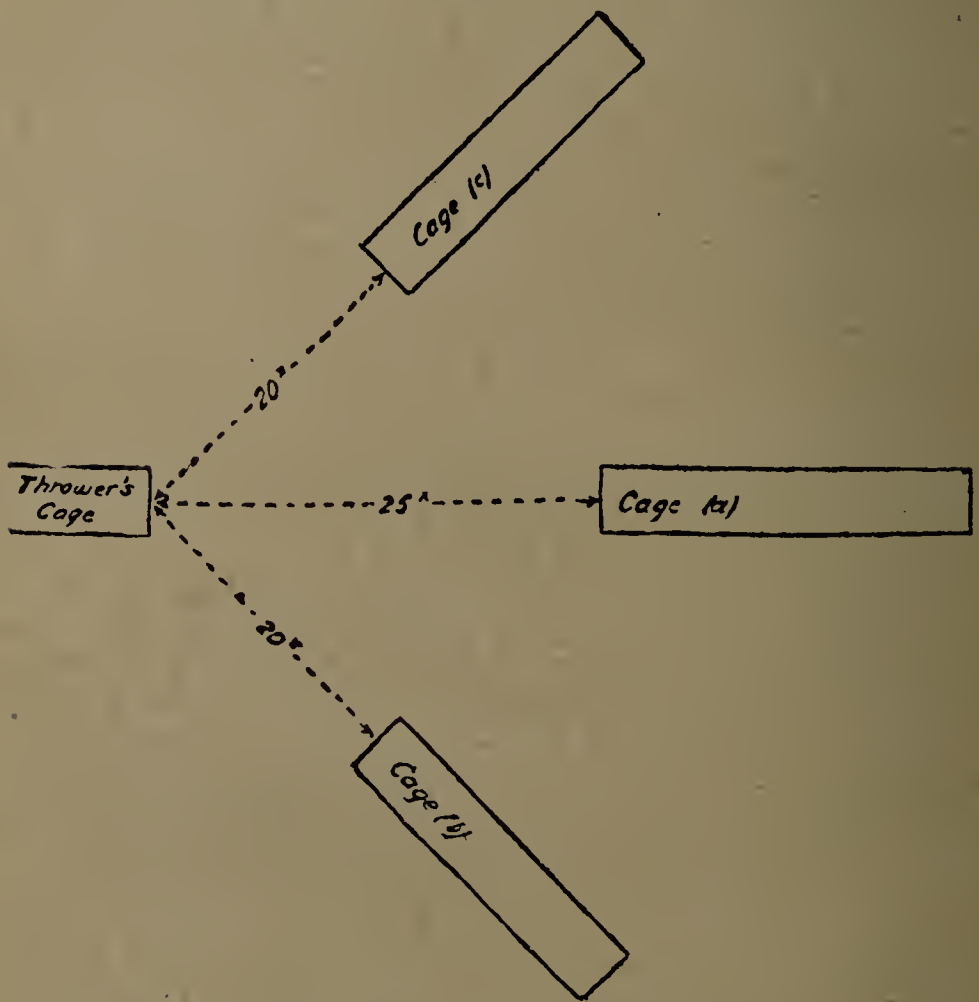


Fig. 95

Dress for first, second, and third tests.—Drill order with haversack, water bottle, and entrenching implement, but without rifle.

119—Training of Specialists:

The present type of warfare in the trenches has involved the training of a proportion of men in infantry units in duties of a special nature, e. g., grenade-throwing, etc.

A word of warning is necessary as regards the training of these men. They must be made to realize that their training in these special duties is *in addition* to their ordinary training as infantry soldiers and must not be allowed to interfere with their performance of the ordinary duties of infantry soldiers, except when they are required for the special duties in which they have been trained.

PART 8.

120—Instruction:

The aim of the instruction should be—perfect safety in the use of grenades, a firm conviction that the grenade presents absolutely no danger to the man throwing it (if he handles it as prescribed), and an absolute confidence in its results and efficiency.

Instruction should be pushed continually and energetically, particularly in moments of leisure. The drills should be frequent. The men should be equipped as for an attack, and the drills should be held in all weather, because rain, wind, and cold influence the range and precision of the throw. To give the men a taste for these drills and waken their ambition, it is recommended that they be rewarded by being excused from some duty, or that prizes be offered to the best grenadiers. Avoid having the drills last too long. A sporting contest acts as a stimulant.

The instructors, officers, and sergeants, should be familiarized with all the details, and should possess, as far as possible, practical experience of combat. All the men of the fighting force should receive grenade instruction, as well as the sergeants and officers up to the company commander. In the Infantry and the Pioneers as large a number as possible of experienced and intrepid noncommissioned officers and men should be selected to form the personnel of the "sturmtrupps" (assaulting troops) and of the "stosstrupps" (following-up troops).

The instruction is given on drill grounds specially prepared, on which the German positions and the enemy's positions in all their

details are marked out, as well as the features of the terrain (shell craters, elements of overturned trenches, destroyed obstacles, etc.). The troops should themselves establish drill grounds in the neighborhood of each cantonment. These drill grounds should also permit of throwing on sloping grund. Figure 96 gives a model for a small drill ground.

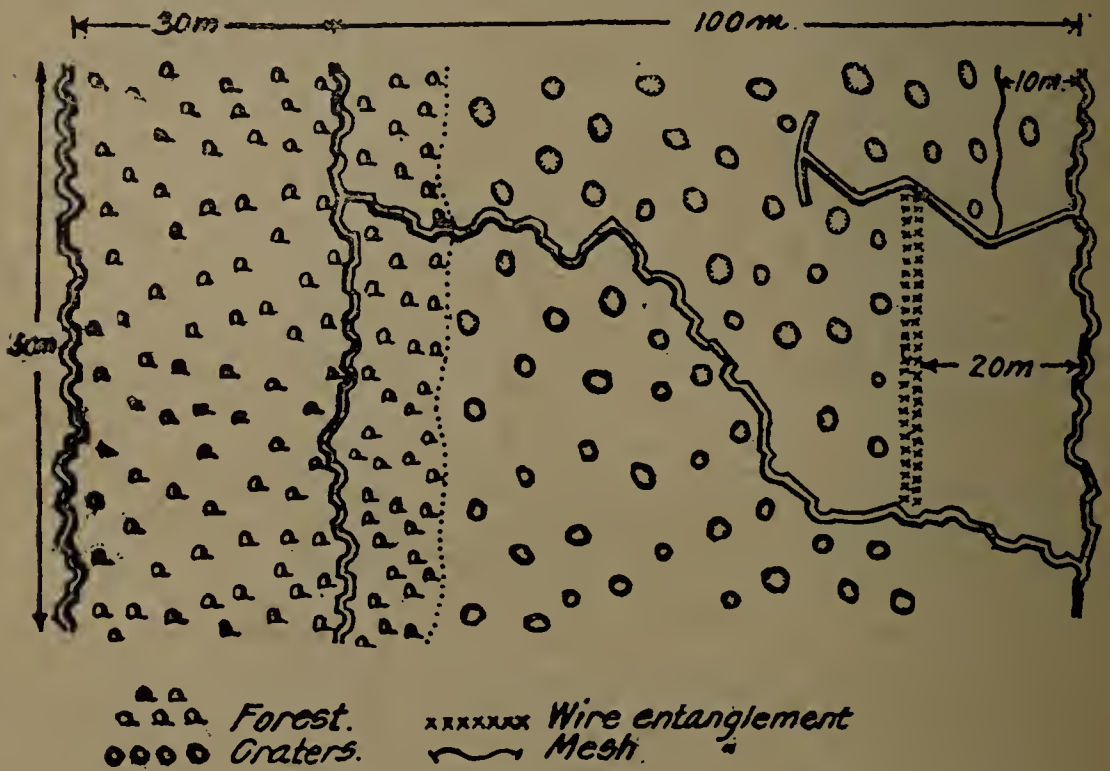


Fig. 96

The instruction begins by talks on the various models of grenades, particularly on the composition and action of the fuses, on the mode of action of the fuse and of the charge or explosive, on the preservation of grenades, their priming, their transport, their use, and the measures of security to be taken in regard to them.

It continues with drills in the throwing of grenades, to be executed without the fuse, or with sham grenades corresponding in shape, weight, and dimensions to the real grenades. Even with sham grenades, always execute all the motions that would

be necessary in handling primed grenades. These motions should pass through the subconscious mind of the grenadier and be executed automatically. It is only under these conditions that he will not forget to reproduce them during the excitement of

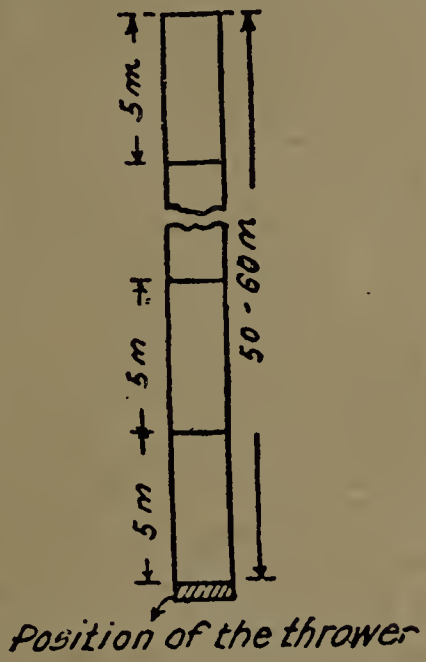


Fig. 97

combat. In order to accustom the men to throw surely and not too fast in the grenade drills, they may be required to throw by the numbers. Grenades should always be thrown at definite targets.

The drills should be executed individually and in groups, standing, kneeling, lying prone, and running. If a man has thrown his grenade while running, he should then lie prone, only rising after the explosion has taken place. A throw lying prone is executed without the man's rising, or in rising to a kneeling position for a short time only; in the latter case, he should rise up for a moment, throw the grenade, and drop down quickly.

In training to throw at a great distance, it is advantageous to establish tracks as shown in figure 97. The drill is executed by one man after another, and the distance attained is announced.

It is important in this drill to preserve the accuracy and direction; the grenades falling outside of the track do not count.

On the drill ground laid out as shown in figure 98, at the command of the sergeant, the man throws a grenade at the designated wooden target. By preference, for this drill use drill grenades with fuses. The man should identify his target at a

Fig. 98

glance, and, at the same time, set the grenade and throw it. The object of the drill is attained when the grenade lands within 1 meter (about 1 yard) of the indicated target and the fuse explodes at once. The same drill will afterwards be executed from a sheltered position with loaded grenades.

Very special importance should be attached to drills in throwing from one trench to another. Use two trenches with sap heads, distant about 20 to 30 meters (21.87 to 32.8 yards) (fig. 99). First occupy only one trench, then both. Use drill grenades, with and without fuses. First, drill the men one at a time in landing the grenade in the enemy's trench under time conditions such that the enemy can not pick it up and throw it out of the trench. After a few drills, a man placed in the opposing trench should seek to take shelter from grenades as rapidly as possible. In order to obtain a plunging fire, establish between the two trenches a fense of about 4 meters (4.374 yards) in height, or a cord stretcher between two posts of 4 meters (4.374 yards) in height, over which the grenade should be thrown.

In throwing by groups, both trenches should be occupied. The two groups of grenadiers practice one after the other. If they are composed of well-drilled men, the two groups may practice simultaneously. The men in the trench should not be placed too near together, as they will crowd each other and will not find sufficient shelter from the grenades thrown at them. In all trench drills, care must be taken that the grenade is not knocked out of the hand by hitting the wall of the trench.

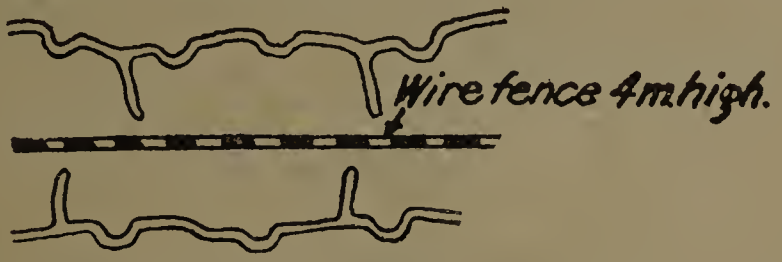


Fig. 99

The throwing of grenades from one sap head to another is to be practiced like the preceding drill, first without a protecting grating and then over the top of a grating. When the adversary has erected similar gratings, use grenades supplied with a hook; these can easily be made by hand out of wire. They stay caught to the grating and destroy it. Drill also in throwing from a shell crater at an enemy placed in another crater.

The throwing of grenades from behind trees and stumps, at a definite target, requires special training.

When the men have acquired sufficient ease in throwing, drill them with loaded grenades, first alone and then in groups. The

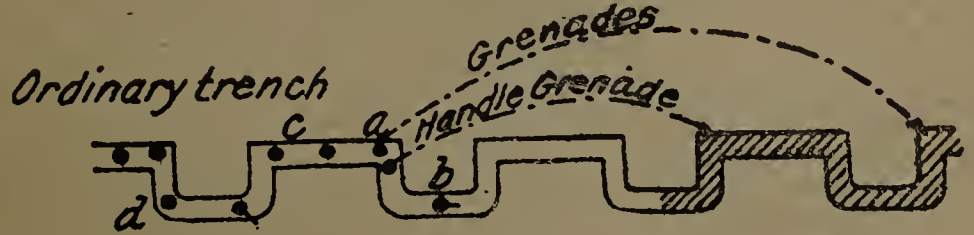


Fig. 100

grenadiers should be able to obtain complete shelter, corresponding as nearly as possible with that sought in actual combat (trenches, traverses, and shell craters). Spectators should be

placed well under shelter, or should keep at a proper distance. The instructor should arrange the drill so that he can follow and conduct it. The safety measures adopted should never be of a nature to awaken fear in the men. All accidents should be

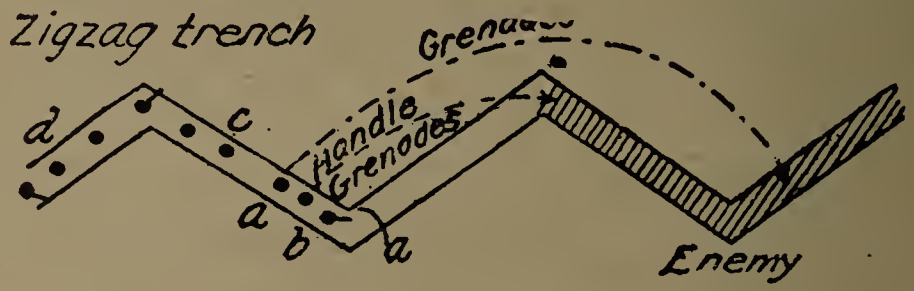


Fig. 101

absolutely avoided, so as not to cause the men to lose confidence in the grenades.

Only those men who have successfully thrown many loaded grenades can be considered as having terminated their instruction.

To permit of the use of enemy grenades found in the captured trenches, it is necessary to drill each man in the throwing of these grenades. Such of these grenades thus picked up as are not needed for the immediate instruction of the troops should be sent to the rear to be converted into drill grenades.

To the regular instruction outlined above are added drills with a given object, as, for instance, the progressive capture of trenches and the fighting against blockhouses and machine guns.

The advance in the trenches should first be practiced in rectangular trenches, then in winding trenches, and lastly in zigzag trenches or those formed by shell craters. For the distribution of groups, see figures 100, 101, and 107.

The two grenadiers placed at A at first act alone. One attacks the nearest traverse by means of handle grenades, the other throws ovoid grenades beyond the first, in order to prevent the enemy bringing up grenades. The leader of the group, B, placed laterally, observes the throwing and indicates the direction and distance of the throw. He also protects the group, by means of a rifle or pistol, against a counter offensive from the front.

The liaison men at C pass the grenades toward the front. The rest of the group at D, who are used as carriers, stay in the vicinity of the rear traverse and protect the flanks against a lateral enemy attack by means of two men armed with a rifle or

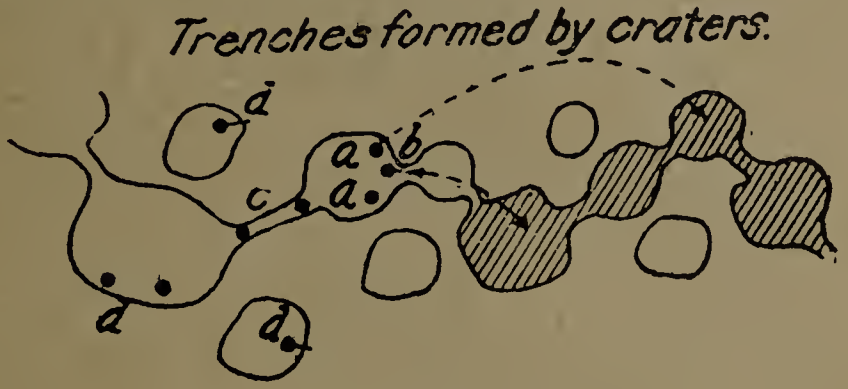


Fig. 102

pistol. The men are distributed in such a manner that they can avoid enemy grenades falling into the trenches.

This drill is also practiced with an adversary. The losses are announced by the umpires. Substitutes should immediately occupy the posts which have become vacant. Each man in the group should be instructed in the different roles to be filled.

PART 9.

COURSE IN DIVISION BOMBING SCHOOL.

Suggested syllabus of course of instruction (11 *working days*), *based on British schools.*

Day and hour.	Place.	Work.
Monday.		
6.00 p. m.....	Lecture hall..	Organizing class into squads.
Tuesday.		
8.45 to 11.30.	Lecture hall..	Introductory lecture. Explosives, fuses detonators, etc.
11.45 to 12.30.	Trenches	Demolitions.
2.00 to 3.00.	Throwing field	Assembling detonators, fuses, etc.
3.00 to 4.00.	Lecture hall..	Lecture: Hand grenade.
4.00 to 4.45.	Throwing field	Throwing practice.
Wednesday		
8.45 to 10.00.	Lecture hall..	Lecture: Tactics.
10.00 to 10.30.	Trenches	Demonstation of trench storming.
10.45 to 12.30.	Lecture hall..	Lecture: U. S. grenades.
2.00 to 3.00.	Range	Nos. 1 to 6 squads—live-throwing practice.
	Trenches	Nos. 7 to 12 squads—inspection of trenches.
3.00 to 4.00.	do.	Nos. 1 to 6 squads—inspection of trenches.
	Range	Nos. 7 to 12 squads—live-throwing practice.
4.00 to 4.45.	Throwing field	Dummy-throwing practice.
Thursday.		
8.45 to 11.00.	Lecture hall..	Lecture: Defense.
11.15 to 11.45.	do.	Lecture: Projecting apparatus.
11.45 to 12.30.	Throwing field	Dummy-throwing practice.
2.00 to 3.15.	Range	Nos. 1 to 6 squads—firing projecting apparatus.
	Trenches	Nos. 7 to 12 squads—trench-storming practice.
3.15 to 4.30.	Reverse places	Reverse squads.
Friday.		
8.45 to 10.45.	Lecture hall..	Lecture: Attack.
11.00 to 11.45.	Range	Nos. 1 to 6 squads—live-throwing practice.
	Throwing field	Nos. 7 to 12 squads—practical work.
11.45 to 12.30.	Reverse places	Reverse squads.
2.00 to 2.30.	Lecture hall..	Lecture: Crater fighting.
2.30 to 4.15.	Throwing field	Squads at disposal of instructors.
4.15 to 4.45.	do.	Dummy-throwing practice.
Saturday.		
8.45 to 10.15.	Lecture hall..	Lecture: Patrols.
10.30 to 12.15.	do.	Lecture: Foreign grenades.

Suggested syllabus of course of instruction (11 *working days*), *based on British schools*—Continued.

Day and hour.	Place.	Work.
Monday.		
8.45 to 9.45.	Lecture hall..	Lecture: Barricading.
9.45 to 11.00.	Range	Nos. 1 to 6 squads—firing rifle grenades.
	Trenches	Nos. 7 to 12 squads—trench-storming practice.
11.15 to 12.30.	Reverse places	Reverse squads.
2.00 to 3.15.	Range	Nos. 1 to 6 squads—firing percussion rifle grenades.
	Trenches	Nos. 7 to 12 squads—trench-storming practice.
3.15 to 4.30.	Reverse places	Reverse squads.
6.00 to 8.00.	Range	Night operations—live throwing.
Tuesday.		
8.45 to 10.45.	Trenches	Practice barricading.
11.00 to 12.30.	Lecture hall..	Nos. 1 to 6 squads—lecture: Trench-defense scheme.
2.00 to 3.30.	Trenches	Nos. 7 to 12 squads—traverse throwing.
3.30 to 4.30.	Reverse places	Reverse squads.
	Trenches	Trench-storming competition.
Wednesday.		
8.45 to 10.45.	Lecture hall..	Lecture: Attack and defense scheme.
11.00 to 11.30.	do.	Lecture: Gas.
11.30 to 12.30.	Throwing field	Helmet drill.
2.00 to 2.45.	do.	Demonstration of night signals, flares, etc.
2.45 to 3.45.	Trenches	Rehearsal for night operations.
6.00 to 11.00.	Lecture hall (outside)..	Night operations.
Thursday.		
8.45 to 10.00.	Range	Nos. 1 to 6 squads—live-throwing competition.
	Throwing field	No. 7 to 12 squads—oral examination.
10.00 to 11.15.	Reverse places	Reverse squads.
11.30 to 12.30.	Throwing field	At disposal of instructors.
2.00 to 4.30.	do.	Firing rifle grenades; throwing tests.
Friday.		
8.45 to 9.15.	Lecture hall..	Explanation of scheme.
9.15 to 11.00.	Trenches	Rehearsal for scheme.
11.00 to 12.30.	Throwing field	Recapitulation.
2.00 to 4.30.	Trenches	Officers' demonstration.
Saturday.		
8.45 to 11.30.	Lecture hall..	Nos. 1 to 6 squads—written examination for officers.
	do.	Nos. 7 to 12 squads—written examination for officers.
	Throwing field	Noncommissioned officers at disposal of instructors.

CHAPTER XI.

THE HAND AND RIFLE GRENADES

By Capt. H. Amann.

I. THE REVIVAL OF THE GRENADE.

About October, 1914, the French and German armies found themselves definitely established and hidden in two long almost parallel lines, the trenches. These trenches were rarely very far apart, about 100 yards on an average, and they sometimes approached to within 20 or even 10 yards of each other. Life in them was at first rather calm. Each side looked on the trenches as a refuge, as a temporary rest. In the intervals between attacks the men in the trenches had no weapons to use against each other. The officers made the soldiers shoot through the loopholes from time to time, which gave them a chance to kill a few crows, but the activity along the trenches was very slight. One was in fact safer at the front than at the rear, because the artillery hardly dared to bombard the enemy's first line because it was so close to its own first line. The principal occupation of the men was cleaning their rifles—no easy job—in preparation for the day when they should get out of the trenches.

They did not get out of the trenches. It was the trenches which made the move. They gradually woke up, and took to arming themselves. What was needed was new weapons, for those which the infantryman carried at the outbreak of the war, the rifle and the bayonet, were hard to handle in the narrow space of a trench. It was necessary to reach an opponent against whom grazing fire was ineffective, to reach him in his hole. Of the new weapons, most of them revivals from ancient siege-warfare, the most popular and most useful is the hand grenade.

Lieutenant Morize, in speaking of machine guns, showed you how at the outbreak of the war there was complete in-

equality between the Germans, who had something like sixteen to a regiment, and the French, who had only four or six. The grenade, on the other hand, was equally unknown in France and Germany. The Germans had only the slight advantage of retaining the word "grenadier," but it meant not a soldier who threw grenades, but a soldier who was six feet tall. The German and French regulations were as silent then on the subject of this arm as the American regulations are to-day. On rare occasions, in the first two months of the war, artillery grenades were used here and there—big balls of cast-iron about the size of a 16-pound shot, which could hardly be thrown ten yards by the ordinary man.

The first actions of any importance in which grenade throwing came into use in large quantities date back to February, 1915, in the region of Mesnil-les Hurlus in Champagne. There we made an advance which gave us a number of German trenches, but in many places we were stopped by the existence of regular mazes or labyrinths and compelled to use grenades in order to continue our move.

We could see at that time a grenade made out of a canned meat tin filled with scrap iron or Shrapnel bullets and detonated by a piece of Bickford's fuse.

To-day the grenade has become the most important weapon of the infantry. The machine gun and the automatic rifle are reserved more especially for picked men, but everyone, the machine gunners included, must know how to throw a grenade. (Besides, it comes naturally; throwing a grenade at a German helmet is as instinctive as for a small boy to throw a snowball at a high hat.)

II. THE PRINCIPAL OF THE GRENADE.

I shall not stop to tell you the history of the grenade in this war. During the first two years, every time that a soldier came back to the front after a stay in hospital, he found a new type in use. Sometimes it woudl be a grenade mounted on a handle —the umbrella-bomb—sometimes a percussion-grenade. None was perfect. In some cases it was hard to learn how to use them.

The problem of the grenade is simple. The grenade consists of two parts:

1. An egg-shaped projectile, hollow, filled with a charge of explosive.

2. An apparatus for setting off the bursting charge. This should be so adjusted as to give the soldier time to throw his grenade before it explodes.

It is evident that the design and construction of the projectile is a simple matter, and as long as you know for what definite purpose it is intended it is easy to make the necessary variations.

But the choice of an ignition plug presents great difficulties. It is necesary, in the first place, that it should endanger the thrower as little as possible. The time elapsed between the lighting of the fuse and the explosion must not be too short, because a grenade is often accidentally dropped in a trench where it is hard to get out of the way. Nor must the interval be too long, or the enemy will pick up the grenade and throw it back. And it must be uniform in all types of grenade, because one cannot expect to teach soldiers how to handle several varieties of ignition plug. It must above all inspire confidence in the men. They are only too ready to love their weapons; their weapons must not go back on them. Each time a new grenade was issued, they were delighted. They are the best judges, and when they are pleased with a new model and then in a few weeks they turn against it, it proves that the grenade is bad. But they have continued to like the present grenade for over a year.

The ignition plug of our grenades is covered by a hood, held in place by a split-pin with a ring through the end of it. This hood holds down a coiled spring. Inside the coiled spring is a Y-shaped spring, which, once released, strikes two percussion caps. To cock the grenade, you pull out the split-pin that holds the hood down, being careful not to let the hood fly up prematurely. When you throw the grenade, the hood flies up, the big spring uncoils, releasing the Y-shaped spring, which fires the caps and starts the fuse burning. The fuse is timed to burn five seconds.

One must be specially careful, of course, to hold on to the hood after the split-pin is drawn.

III. TYPES OF GRENADE NOW IN USE.

Attempts have been made to give grenades all the variety and all the specialized functions of the artillery shell. Just as

there are high explosive shells, incendiary shells, asphyxiating shells, there is a corresponding variety of grenades.

Explosive hand grenades:

One must distinguish between grenades for the *defensive* and the *offensive*. "FI," the defensive grenade, has a casing of cast steel about the size of a goose egg, weighing 450 grammes. The outside of this casing is crisscrossed with deep grooves, so that it breaks up into small pieces when it explodes. It contains a charge of 60 grammes of explosive, called cheddite. Its total weight, when fitted with the ignition plug, is about 600 grammes—not much more than a pound. It is called "defensive" because it must be thrown from a protected position, as the fragments, which are very destructive, may scatter nearly 200 yards round. The best grenadiers can only throw it about 35 yards—perhaps 40-odd for baseball players—so in the open they might easily be hit by fragments coming back toward them. This is the usual trench grenade. It is very destructive; it is not uncommon for ten men to be hit and killed or badly wounded by the same grenade.

"OF," the offensive grenades, is intended not so much to wipe out the enemy as to have a moral effect on him. When storming troops rush a trench, it is evident that they must fight the enemy almost hand to hand. "FI" would be as dangerous to the attackers as to the occupants of the trench. A sort of grenade has therefore been invented especially for attack, which can be used at short range in the open. The grenadier can throw it a very short distance, nine or ten yards, without risk of being hit by dangerous fragments. This grenade is rounder than the other and much lighter. Its casing is not cast steel but tin, only three-tenths of a millimeter thick. Its charge, however, is heavier—150 grammes of cheddite. The total weight is 255 grammes, say one-half pound, so the soldier can carry twice the number. One might think that it would be useless on account of its limited effect, but as a matter of fact the arrival of twenty grenadiers throwing these projectiles, which make a terrible noise and a great deal of smoke and dust, always frightens the enemy.

We have two other types of grenade which we sometimes use.

1. *Asphyxiating grenades,* containing no explosive, but only a detonator and some liquid. When exploded they release suffocating vapors, and they may be used to force the enemy out of enclosed spaces such as dugouts and underground chambers. They can be used at short range, but one must be careful not to throw them to windward.

2. *Incendiary grenades,* of various models, filled with molten white phosphorus, and intended to set fire to underbrush, shelters, and dry woods. They give out considerable smoke, which is not suffocating, and can therefore be used to conceal working parties or preparations for attack.

Of all these types, you see, only one is a very effective and dangerous weapon—the defensive grenade FI. It is impossible to exaggerate its effect. A grenadier, properly supplied, can throw ten or fifteen a minute.

But the range of this weapon was found to be insufficient. More than 30 or 40 yards away the enemy was out of reach of grenades, so methods were devised of propelling the grenade further. The most ingenious is the one which succeeded without introducing a new implement into the trenches. The *Viven Bessieres* method consists of shooting a grenade from the ordinary rifle of the infantryman.

A funnel-shaped projection, suggesting the mouth of a blunderbuss (tromblon), made of cast steel, weighing about 3 pounds and about a foot long, is put on the muzzle. A grenade is put into this. This grenade is made of cast iron, scored with grooves on the inside instead of on the outside like the "FI," to insure breaking up. It has to slide into the funnel, so it must be kept smooth and free from rust. It weighs 450 grammes —almost a pound. It is charged with explosive and pierced by two tubes, one at the side containing the cap, the fuse and the detonator; the other in the middle, continuing the line of the rifle barrel through the core of the bomb. The rifle is loaded with an ordinary cartridge, and is fired. The bullet hits a trigger which projects very slightly near the outlet of the central tube; this trigger touches off the cap, and at the same moment the gas produced by the explosion of the cartridge in the barrel expands in the funnel and propels the grenade.

The maximum range is about 200 yards. The shot can be aimed. The rifle can be fired from the shoulder, but it is better

to rest it when shooting, either on the ground or on a tripod base, or held against the hip. A table has been worked out which enables one to discover readily the necessary angle for a given range—45 degrees for 180 metres, 70 degrees for 116 metres, 85 degrees for 31 metres. The higher the angle the more the fire will be plunging, and therefore effective against trenches. The explosion takes place about as the grenade lands at the minimum range—that is to say, after about 8 seconds; and about 2½ seconds after it lands at extreme range. It is thus visible in the air, just as trench torpedoes, "crapouillots" and sometimes big shells are visible.

This grenade makes an excellent barrage and it is possible to shoot 7 or 8 a minute. The barrel gets hot pretty quickly, (which results in an increased range, about 20 metres at 45). It is also an excellent means of annoying the enemy and causing them considerable losses.

There are, then, three principal types of grenade: two hand "OF" and "FI," which are generally used by all the armies on the Western front; the "V. B." rifle grenade, which the English also have adopted.

IV. THE GRENADIERS.

Such is this new, or rather revived, weapon, which has attained in the present stage of the war a satisfactory degree of perfection. Let us now see what soldiers should know how to wield it.

The answer is simple: Everybody. Without exception. The automatic rifleman, the machine gunner, the artilleryman, even, should know how to use the grenade, just as well as he should know how to use the rifle. The grenade and the rifle should be the two instinctive arms of the soldier. Nor should they be in competition with each other. There has been a tendency during the last year both in the English and French armies to relegate the rifle entirely to the background. The soldiers who were supplied with grenades took the first opportunity to drop their rifles so as to have less to carry. But there are two serious objections: First, from the point of view of military discipline and instruction, the rifle is the backbone of the soldier; secondly, it is easier to bring up a supply of cartridges than it is to bring up a supply of grenades, and it is essential that the

grenadier should not be unarmed as soon as his stock of grenades is exhausted. The rifle is heavy, but the proper solution would be to give the grenade thrower a rifle lighter and easier to handle than the usual one; a carbine would serve admirably.

To quote the French regulations:

"One must realize that the grenadier who has no more grenades has no right to consider his task completed; he should fight with his rifle until a sufficient supply of ammunition is brought up. No idea can be formed of what the supply of grenades is going to be after an attack on a limited objective, carried out by a series of rushes covering several kilometres in successive stages. It would be culpable negligence not to foresee deficiencies in supply lasting for several days in succession, and to separate the grenadier from his rifle at a time when he must push ahead, with his grenades or without them."

Then, prior to selection, every private soldier must be taught to throw the grenade, standing, kneeling, and prone. He must know how to light the grenade, and the length of time required for the fuse to burn out. He must be got to overcome his natural fear of the thing; and therefore be shown by letting burn a fuse alone, and the extent of that duration. Then he is taught with dummy grenades with the fuses set, observing carefully how long it takes for the fuse to burn down to the grenade. All this is taught in the open; the grenade being bowled over head, is preferable to throwing, it is just as accurate, if not more, and not so exhausting. Moreover, it gives better curved fire, which is an absolutely necessary condition with hidden or sheltered targets.

All that precedes refers to the elementary training of every private, but fighting as it is conducted today requires that every man shall have his specialty, and specialized training is therefore given to certain men called picked grenadiers.

On picking out an elite grenadier, one should consider physique and morale (steadfastness and courage), for it is not always the physically strong man that makes the best grenadier. The morale is of the very highest importance because the grenadier is in fact a leader for the other men of the platoon. You know what our platoon consists of: I repeat, in order that you may the better understand the part played by grenadiers.

The platoon includes four squads:

The first consists of a corporal and seven grenadiers.
The second of a corporal and six automatic riflemen.
The third of a corporal and eight men (voltigeurs), two V. B. rifle grenadiers, and one V. B. ammunition carrier.
The fourth squad is the same as the third, but with one more man (voltigeur).

Thus out of 36 men there are 14 grenade-specialists. They wear a special badge on the arm—a flaming grenade. These 14 grenadiers receive in addition to the ordinary training, special instruction which teaches them to prepare charges of explosives, to make practice grenades and to use German grenades and detonators. The grenadiers of a company and of a battalion get together for practice under the orders of a commander appointed by the colonel, and make themselves expert. Grenadiers are thus produced who can throw a grenade at 40 metres into a specified trench, and more important still, groups of grenadiers are trained to work together. The work of a platoon in combat is real team-work; the grenadiers are a part of the team, and among the grenadiers themselves each man plays his position: there are throwers, supply-men, and the grenadier's aid, who is the safety man, acting as sentinel to the group. Each one should answer immediately to his designation: thrower, supply-man, aid. In the platoon, the group forms according to the needs of the moment: either a corporal, two throwers, two supply-men, two aids and a substitute, or else two-groups of three grenadiers each. It often happens, for a particular operation, that they are combined into larger groups, with all the grenadiers of a company even, ocasionally, of a battalion. It is on this idea that one must insist: the rôle of the grenadier is not that of a brilliant individual performer, but of a unit in a group. It is all very well for a soldier to throw a grenade 40 yards, but it is important above all that the group of 4 or 8 grenadiers should achieve complete co-operation.

The *thrower* has his hands entirely free and carries his rifle slung across his shoulder. He has a trench knife and a revolver. Often he is relieved of his rifle, or gets rid of it himself.

The *supply-man* carries grenades, and keeps the thrower supplied. He is armed like the thrower, and replaces him if he is wounded.

The *aid* is sometimes called the *scout*. His duty is to insure

the security of the throwers. He should be alert, a very good shot, and very useful with the knife or the bayonet. Aids are stationed on the flanks of the throwers when the attack is directed towards the front. In the enemy trench, they go ahead, lead the way round traverses, observe the fall of the grenades, and give notice when a further advance is possible. In street fighting they keep special watch on doors and windows.

To give you an idea of what their work is like, here is an example of the tests to which candidates for positions as grenadiers are submitted:

Elimination test:

1. On open ground: throw 10 grenades of various types at determined distances, standing and kneeling (standing, 30 metres; kneeling, 20 metres). Dimensions of the target trench: 1 m. wide, 1 m. deep, 3 m. long.

2. From a trench 1 m. 80 c. deep, throw 10 grenades, plunging fire, into another trench, 20 metres away, of the same dimensions as before. Half the grenades should land in the target in each case.

3. Standing: throw grenades into a firing trench, first over one traverse and then over two traverses. (Dimensions specified). Six assorted grenades in each case; 5 of each 6 should arrive.

Second test:

1. Take apart a grenade of each model. Answer 6 questions on the properties of grenades, detonators, fuses, ignition plugs. Six questions on manipulation of grenades. Six questions on the tactics of grenade fighting.

2. Throwing grenades from a trench into a trench, as before, but with live grenades; 3 out of 6 to land.

The candidate is marked on each test; passing mark, 60 per cent.

A second try is allowed at the first test. A man who fails on the second is sent back for further training.

Then, I repeat, I insist, this teamwork of the grenadier squad, combined with the other squads of the platoon is an important and delicate part of the instruction; the aim is to form a homogeneous squad whose motto shall be:

Strike quick, strike hard, strike all together

It is far better to have a good average squad, accustomed to act as a whole than one or two remarkable individuals.

V. TACTICAL USE OF THE GRENADE.

The grenade is constantly used. Let us study its rôle in the three different phases of trench life: *Daily fighting,* or *"warfare of attrition," the defensive,* and *the attack.*

Warfare of Attrition:

The idea of the soldier in the trench is to make the enemy trench untenable. For two reasons: first, one must establish a clear superiority over the enemy and destroy his trench so he cannot destroy ours; and incidentally cause him constantly loss of men; secondly, one must make the soldiers feel a moral superiority, that the enemy is harassed, worried, so that when the time for attack comes they will feel greater confidence and enthusiasm. The rifle can rarely be used; it is all right for shooting at patrols, at visible loopholes,—which are usually dummy loopholes. But the grenade is the ideal weapon. The hand grenade first—when they know the enemy's trench well, the hours of the reliefs, certain grenadiers spend the whole day throwing grenades. But the most grateful grenade for this daily fighting is the rifle grenade. The V. B. grenade can inflict greater loss on the enemy than artillery bombardment. The details of the enemy's trench once known, the rifles are kept on tripod, constantly trained on the points marked—observation posts, approaches to shelters, crossings of boyaux, etc.—and, at the slightest sign of movement, a grenade is fired. This is kept up day and night, and even if the enemy keep down out of sight, avoid clustering at danger points, and duck into their own shelters as fast as they can, it is possible to inflict severe losses by keeping up a constant fire on properly chosen points.

This may be done either by *individual fire,* slow and continuous, especially at night, and on the places where the boyaux join the trenches, the observation stations, shelters and latrines. Or else it may be done by *surprise fire,* several grenadiers standing together and shooting as a team, keeping it up for several minutes without stopping, against reliefs, fatigue parties,—such as soup details, for instance—or against working parties, to

prevent the repair of damage done by artillery to wire-entanglements or other defenses.

Execution of Raids:

The grenade is also indispensable in raids. Raids are the little expeditions which are made, generally at night, into the enemy lines. In certain armies these are called "Cook's Tours" or "pleasure parties." They are carried out by small bands of picked men from among the grenadiers. Their main object is to go and collect a few prisoners to get information from them as to the enemy's intentions. These prisoners are taken either in a listening post or in a sap-head or, more often, in the enemy's trenches. Another object is to explore a new trench, or destroy a part of it, and in general to cause confusion among the enemy—but that is a secondary object. You will understand with what care such delicate operations have to be carried out. They must be prepared a long time in advance; often the men are taken to the rear to rehearse on a terrain chosen for its similarity to the scene of the coming raid. The nights preceding, the route is explored; often stores of grenades are left along the way, in shell holes or other specified places, so that a good supply will be assured.

In order to recognize each other, the men adopt a common signal: sometimes they wear black masks or veils to hide their faces. They take along electric flashlights, which they never hold in their hands, because the enemy shoots at the light, but fix on their rifles or sticks, so they can look into shelters. All the inventiveness and ingenuity possible is encouraged and turned to account in the planning of these expeditions. On the date agreed on, either on a dark night, preferably in the rain, they start off, often taking a telephone along. The men in the trenches open fire and make a great row to distract the enemy's attention and cover any accidental noises they may make as they go. When they arrive at the enemy line, they let loose a shower of grenades, and as soon as these have gone off they jump in. One party rushes to the right, another to the left, killing or taking prisoner any adversaries they meet. The grenadiers' aids keep watch at the extreme wings, and if necessary make barricades across the trench. Close contact, meanwhile, is kept up between the party and the trench they

came from, either by prearranged signals, shots, or telephone, so that the rockets can be sent over to light their way, or supplies of grenades or cartridges sent out. Their mission accomplished, they leave the trench and retire by a route prepared in advance, often different from the one they followed on their way forward. They pass through the entanglement by channels cut the night before, run on the slant so as to escape the notice of the enemy, and they come home without hurrying, but pretty quickly, because there is hot coffee and rum waiting for them.

These raids are more frequent on the English front than ours. As I said, we use them only to obtain information and prisoners. The English have a predilection for this kind of fighting, and train men especially for it.

Defense:

In case of attack by the enemy, all soldiers should be able to keep up a continuous fire of grenades at a range of twenty-five yards. The defense is prepared beforehand for the grenadiers as it is for the machine gunners. In the plan of defense of the company or battalion positions for grenadiers and stores of grenades should be provided in advance. There are some in the first line, some in the lateral communication trenches, all along the boyaux, in the neighborhood of the more important traverses and elbows; at every point where an enemy can easily be obstructed there should be a supply of grenades ready. The grenadiers are scattered in little groups along the line; it is calculated that one man can protect a front of 10 metres with OF grenades and a front of 25 metres with FI grenades. Often two lines of grenadiers are placed very close together; those of the second line throw over the heads of the first. There is a greater number of grenadiers on exposed fronts and salients.

The V.B. rifle grenades are particularly useful on the defensive. One can mass the sixteen grenade rifles of the company and drop 150 grenades a minute along the front at a range of 80 to 150 metres. It is very hard for the enemy to pass through this fire. This defense is especially valuable when the attack is too close to be stopped by artillery fire. As always, flanking fire is what one should seek to attain, and for that purpose tables of ranges and angles and emplacements are arranged in advance to cover certain sections of trench or stretches of ground.

Attack:

In the course of a general attack, it is impossible to execute a grenade attack against a trench that is entirely intact. All the defenses of the trench should first be destroyed by the artillery; otherwise, having got as far as the entanglements or even the loopholes, the grenadiers may have to stay there and wait for the night before they can safely return. If the attack takes place at six in the morning, that gives them a pleasant day!

But once the infantry has set foot in the enemy position, only grenadiers can make progress along the trenches. That is their most important function, and the one which I wish to emphasize.

The assault is followed by a struggle inside the enemy's position. In general, in the last year, the front trench has been almost empty. One or two grenades are enough to put out of action the few survivors. But there is a double task to be done. First, to make progress in the boyaux, and the communication trenches of the enemy, and go as far ahead as possible. Secondly, to leave no enemies behind as one advances. These two duties are the principal concern of the grenadiers.

Progress Along Trenches and Boyaux:

There are a few specially important points to remember: One is fighting against an enemy of unknown strength; all that one can tell is that he has been worried and wearied by the bombardment, but he may have received reinforcements, and he may have prepared ambuscades, or an enfilading fire of rifle grenades. One must therefore advance with the greatest caution exposing to the grenades or the traps of the enemy only a minimum of men; leave the boyaux as free as possible so that traffic and supply will be easy; maintain the strictest silence, so you can hear whether the enemy is near and whether he is making preparations. The grenadiers are usually familiar with the topography of the enemy's trenches, their leader has a map, and each group has a special duty to carry out; the men of a certain group know that they must get to a certain boyau, to a certain "place d'armes," to the Arnim trench, to the "Rue des Mouches," and they are delighted when an occasional German signboard shows them that they are on the right road. Some of the grenadiers throw their grenades at the nearest enemy

group, others at the furthest they can reach, to prevent supplies from coming up.

As they advance they meet a barricade of sandbags; if there are enemy behind it, they blow it up with a charge of explosive; if they come to a suspicious traverse, they toss a grenade over it, then the aid advances alone, explores it, and calls back to his comrades. The aid is followed by two throwers and a group commander, who is also a thrower. A few yards behind come the supply-men, one by one, keeping their distance, and an extra aid ready to replace the first one. All the rest of the group stay 10 or 15 yards behind, taking care of the supplies brought by men from the rear, the baskets and bags of grenades; and they collect enemy grenades that have been left in the trench—often the chief source of supply. They fill sandbags (which are carried empty and are filled on the spot as needed); they prepare the blasting charges for blowing up shelters and barricades; they keep up a fire of rifle grenades; they assure contact with the rear, sending back accounts of progress, requests for reinforcements, etc.

Meanwhile the grenadiers go forward. Occasionally the aid notices a boyau leading into the trench. Then the commander of the group assigns one or two throwers to the boyau, which is exploded before. If it is impossible to follow this boyau very far, a barricade of sandbags, guarded by one or two men, is built across it at a considerable distance from the main trench. The making of these barricades is very important; the men who build them are picked in advance. They know that it is necessary to make them so that their grenadiers will have as much room as possible and the enemy grenadiers as little as possible.

If the enemy makes a powerful rally and regains the upper hand, the barricade of sandbags is equally indispensable; it makes it possible to contest the ground foot by foot; as many as possible should be built, for ground conquered should never be abandoned. The best system is to make a first barricade, then cave in the trench behind it by blasting, then build a second barricade and retire behind that. Thus the enemy will have to cross an open space where he will be unprotected and will fight at a disadvantage.

The grenadiers should try to draw the enemy into selected

places where he will be able to use only a few grenadiers against many.

Such is the fighting which follows an attack. All these little groups rush ahead wherever they can work their way, always advancing in the direction of the enemy's second line, and arriving finally before this next line, which halts them. But between the different lines groups of the enemy have gathered; resistance has been organized round German officers; some, taken by surprise, come up out of shelters, others, who have hidden till the first French wave goes by, come out of underground passages and attack from the rear; others who have pretended to be dead or wounded revive and open fire. All these must be got out of the way and the captured trenches entirely cleared before the arrival of the reinforcements, the machin guns, and the trench guns. Otherwise enormous losses may result, and a victorious advance be transformed into a check—this happened to the English at Contalmaison, where a division was cut up by an attack from behind. This very important duty is called "trench cleaning," (nettoyage).

The "moppers up," as the British call them, are chosen beforehand. They follow close behind the first wave. They are organized in groups, sometimes belonging to the same company, sometimes to the same battalion; it is the battalion commander or the colonel who designates the groups, either half-platoons or platoons or even companies. They are often given a special badge—so that they may be recognized and the soldiers of the first wave shall not be tempted to lag behind and mix in with them. They leave their own lines a few seconds after the first wave. They do not jump down into the enemy trenches immediately, but run quickly alongside them, dropping grenades as they go; whenever they see a shelter entrance they throw a grenade into it. As the entrances to shelters are often well hidden they have to keep a sharp watch for them. If any Germans surrender, the non-commissioned officers have them sent back at once, in charge of one or two soldiers. Each group of "cleaners" has an assigned sector and a carefully designated route.

The second duty of the moppers-up is to overcome the resistance of enemy parties who still hold out. This operation must be performed with great speed and determination, for

the resistance of an isolated group may cause heavier losses than the attack itself. It is further essential that the "moppers" should not be mere amateurs out for a stroll. They must have carefully chosen leaders. And they must be trained in the use not only of grenades but of all other arms, especially the trench knife and the automatic pistol.

The Supply:

The consumption of grenades has reached such an amount that it is of the greatest importance that every commander should constantly think about the question of supply. Measures should be taken in order to prevent the shortage of grenades during action, counting one grenade out of two at best will reach the line, owing to accidents and casualties among the carrying parties. On the other hand, the grenadiers themselves cannot carry, as an average, besides 6 cartridge packages of eight rounds each for their rifles, more than 10 FI grenades, or 20 OF. Then again they always carry one or several sandbags.

In defensive, the consumption is even greater, but then, as a rule, time and comparative convenience have been available to refill, and constitute dumps. Every grenadier, having at his side a box containing FI grenades, throws them as far and as quick as possible, so as to develop such intensity of fire that it creates an impassible iron curtain. Any untrained men will throw 15 grenades in a minute; trained bombers can throw 20, even 25. At that rate the 4 squads of a company will fire away in a minute 600 grenades. This gives you an idea of the violence of the fire that can be developed, and at the same time of the tremendous consumption of ammunition.

Let us now, gentlemen, ask ourselves, as a practical conclusion, what we can expect from the use of the grenade. As we have seen above it originated in a period of comparative fatigue, after the first and tremendous impetus of the huge battles had spent itself, when the tired enemies had settled on opposite lines, tired yet formidable, confronting and dreading and menacing each other, under the threat of a sudden renewal of the recent horrors of hand-to-hand fighting. They could not see each other, they could not fire at each other; they could not or must not rush at each other under the penalty of terrible and maybe unavailing sacrifices; they must wait for their Chiefs to

organize the battle to come under the new conditions; meanwhile were they to remain idle, by the side of their now almost useless rifles? But hatred of the foe still inflamed them, and the sense of their own security told them that they must keep up a pretence of aggressiveness at least, and harass the foe and force upon him the fear of a more determined antagonist. Their instinct prompted them to hurl stones at him; I witnessed the fact in February, 1915, when we had not as yet seen anything like a grenade. When these were given to us, however imperfect and clumsy at first, we cheerfully seized upon them as the long desired weapon.

Grenade fighting delays the moment of the ever to be dreaded hand-to-hand fighting; this is so far true that in the last battle for the Messines ridge an eye-witnessed described the English and Germans hurling grenades at each other in some places quite out of range, without daring to come to close quarters. And still the English are good bayonet fighters and are taught to rely on the virtues of "cold steel"; but it was at the end of the fight and as I said the desire for good wholesome hand-to-hand encounter is apt to subside somewhat after the first hours of strenuous exertion and exposure to danger.

Both in offensive and in defensive, the grenade then appears as a potent and economical means of getting rid of the adversary without having to use the bayonet. Indeed, in the defensive, it gives an enormous superiority over an assailant deprived of the like means. Consequently, in the offensive, success is to be attained only by the possession of better grenades than the enemy's, and better grenadiers, able to throw farther and faster and with greater accuracy. You may know the story of a hotly disputed vantage-ground on the Cornillet which it took a whole regiment to conquer. While 60 chosen German grenadiers came up and inflicted such severe losses on the companies left for occupancy, that they had to fall back somewhat and abandon the precious and dearly bought crest. We had to report to the Army School of Bombers; 10 of them, the pick of the school, along with a supporting party of 30 men, attacked the Germans, and from the first volley, killed ten; then followed two hours of stubborn grenade fighting, during which the French only threw 10,000 grenades; at last the beaten Germans flew to their dugouts, where to they were chased and killed by the French.

My final conclusion is specially for America. Americans are specially fitted to form an army of grenadiers, because grenadiers should have the team-work of football players and the skill of baseball players.

UNIVERSITY OF ILLINOIS-URBANA
623.45114 K63M C001
Manual of grenades and bombing /
3 0112 088611816